STIC Search Report
EIC 1700

STIC Database Tracking Number: 207472

TO: Kelly M Stouffer
Location: REM 8A64
Art Unit : 1762
November 16, 2006

Case Serial Number: 10/664431

From: Mei Huang
Location: EIC 1700
REMSEN 4B28
Phone: 571/272-3952
Mei.huang@uspto.gov

Search Notes

Examiner Stouffer,

Please feel free to contact me if you have any questions or if you would like to refine the search query,

Thank you for using STIC services!

Mei Huang

SCIENTIFIC REFERENCE BR
Sci & Tech Inf · Cntr

Access DB# 207472

SEARCH REQUEST FORM

NOV 15 RECD

Scientific and Technical Information Center

Pat. & T.M Office

Requester's Full Name: Kelly Stouffer Examiner # : 82787 Date: 11-14-06
Art Unit: 1762 Phone Number 30 22668 Serial Number: 10/664311
Mail Box and Bldg/Room Location: 8A64 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Nanostructures including a metal

SCIENTIFIC REFERENCE BR
Sci & Tech Inf · Cntr

Inventors (please provide full names): Hyungsoo Choi

NOV 15 RECD

Earliest Priority Filing Date: 9-19-2003

Pat. & T.M Office

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Carbon nanowires/nanostructures formed w/out supports for patterning (free-standing) by vapor deposition (CVD) from organometallic precursors (specifically Cu(ethylacetoacetate)L_2 where L = trialkyl phosphite and the species in Cl. 23 – but I may have already found a 103 for Cu CVD precursors)

****

STAFF USE ONLY	**Type of Search**		**Vendors and cost where applicable**
Searcher: MQH	NA Sequence (#)		STN ✓
Searcher Phone #:	AA Sequence (#)		Dialog
Searcher Location:	Structure (#)	1	Questel/Orbit
Date Searcher Picked Up:	Bibliographic		Dr.Link
Date Completed: 11/16/06	Litigation		Lexis/Nexis
Searcher Prep & Review Time:	Fulltext		Sequence Systems
Clerical Prep Time:	Patent Family		WWW/Internet
Online Time:	Other		Other (specify)

PTO-1590 (8-01)

What is claimed is:

1. A method, comprising:

performing vapor deposition with an organometallic vapor including copper to form a number of nanostructures on a substrate, the nanostructures each being freestanding during formation and composed of a material including copper; and

wherein said performing provides the nanostructures each with a first dimension (W) of 500 nanometers or less and a second dimension extending to a respective free end of at least ten times the first dimension. (H)

2. The method of claim 1, wherein the nanostructures are each monocrystalline.

3. The method of claim 1, wherein the nanostructures are each in the form of nanowires with the second dimension being at least 50 times greater than the first dimension, and the nanostructures essentially consist of copper.

4. The method of claim 1, wherein the organometallic vapor includes Cu(ethylacetoacetate)L_2 with L being trialkyl phosphite.

5. The method of claim 1, which includes enclosing the substrate and the vapor in a chamber and generating the vapor by evaporating a copper-containing precursor.

6. The method of claim 5, which includes heating the substrate to no more than about 400 degrees Celsius during said forming.

7. The method of claim 5, which includes providing oxygen during the vapor deposition so that the material includes an oxide of copper.

8. The method of claim 5, wherein the vapor deposition is of a chemical vapor deposition type.

9. A method, comprising:

depositing a number of monocrystalline nanowires on a substrate from an organometallic substance, the nanowires each being freestanding during deposition and composed of a material including a metal; and

providing the nanowires with a first dimension of 500 nanometers or less after the deposition is completed.

10. The method of claim 9, which includes incorporating one or more of the nanowires into at least one of an integrated circuit device, a device to process signals having a frequency of 100 GHz or more, a display device, and a sensing device.

11. The method of claim 9, wherein the metal is copper and the material essentially consists of copper.

12. The method of claim 9, wherein the organometallic substance includes Cu(ethylacetoacetate)L_2 with L being triakyl phosphite.

13. The method of claim 9, wherein said depositing includes performing a chemical vapor deposition with the organometallic substance and heating the substrate during said performing to a temperature of no more than about 400 degrees Celsius.

14. The method of claim 9, wherein the first dimension of each of the nanowires is 50 nanometers or less.

15. A method, comprising:

noncatalytically forming a nanowire on a substrate by performing vapor deposition with an organometallic substance;

growing the nanowire during said forming in a direction away from the substrate, the nanowire being freestanding during said growing; and

wherein the nanowire has a first dimension of 500 nanometers or less and a second dimension extending from the substrate to a free end of the nanowire at least 10 times greater than the first dimension.

16. The method of claim 15, wherein the nanowire is one of a plurality of nanowires made on the substrate during said forming and each of the nanowires has a diameter of 50 nanometers or less.

17. The method of claim 15, wherein the nanowire is monocrystalline.

18. The method of claim 15, wherein the nanowire essentially consists of copper or an oxide of copper.

19. The method of claim 15, wherein the organometallic substance includes Cu(ethylacetoacetate)L_2 with L being trialkyl phosphite.

20. The method of claim 15, wherein the vapor deposition is of a chemical vapor deposition type and said forming includes enclosing the substrate in a chamber and heating the substrate to a temperature of 400 degrees Celsius or less during the vapor deposition.

21. A method, comprising:

growing a number of monocrystalline nanowires on a substrate from an organometallic substance including copper, the nanowires each being composed of a material including copper; and

providing the nanowires with a first dimension of 500 nanometers or less after said growing is completed..

22. The method of claim 21, which includes incorporating one or more of the nanowires into at least one of an integrated circuit device, a device to process signals with a frequency of 100 GHz or more, a display device, and a sensing device.

23. The method of claim 21, wherein the organometallic substance includes $Cu(R^1OCOCR^2COR^3)L_x$, wherein:

R^1 is a C_1-C_9 hydrocarbyl group;

R^2 is H, fluorine F, or a C_1-C_9 hydrocarbyl group;

R^3 is a C_1-C_9 hydrocarbyl group or an alkylsilane group of the formula {-Si(R^4)(R^5)(R^6)}, in which R^4, R^5, and R^6 are each H, F, a C_1-C_9 hydrocarbyl group, or a C_1-C_9 alkoxy group of the formula {-OR}, in which R is a C_1-C_9 hydrocarbyl group bonded to silicon (Si);

x is 1, 2, or 3; and

L is a ligand of the formula {P(R^7)(R^8)(R^9)}, in which R^7, R^8, and R^9 are each a hydroxy group, a C_1-C_9 hydrocarbyl group, or an alkoxy group of the formula {-OR}, in which R is a C_1-C_9 hydrocarbyl group.

24. The method of claim 23, which includes performing chemical vapor deposition with the substrate at a temperature of 400 degrees Celsius or less and a pressure of 1.0 torr or less during said growing.

25. The method of claim 24, wherein said performing includes decomposing a vapor to release at least a portion of the copper included in the copper of the nanowires.

26. The method of claim 21, wherein the first dimension of each of the nanowires is 50 nanometers or less and the material essentially consists of copper or an oxide of copper.

27. The method of claim 21, which includes incorporating the nanowires into at least one of an integrated circuit device, a device to process signals having a frequency of 100 GHz or more, a display device, and a sensing device.

28. An apparatus, comprising:

a substrate;

a plurality of freestanding nanowires attached to the substrate, the nanowires each being monocrystalline and including copper; and

wherein the nanowires each include a respective free end, each have a first dimension of 500 nanometers or less, and each have a second dimension extending from the substrate to the respective free end, the second dimension being at least 10 times greater than the first dimension.

29. The apparatus of claim 28, wherein the nanowires contact a substrate surface comprised of at least one of a semiconductor, a dielectric, and a metal.

30. The apparatus of claim 28, wherein the substrate is comprised of silicon dioxide.

31. The apparatus of claim 28, wherein the nanowires consist essentially of copper.

32. The apparatus of claim 28, wherein the nanowires include an oxide of copper.

33. The apparatus of claim 28, wherein the first dimension is less than 10 nanometers.

34. The apparatus of claim 28, wherein the second dimension is at least 50 times the first dimension.

35. The apparatus of claim 28, wherein the substrate includes a semiconductor surface and the nanowires contact the semiconductor surface.

36. The apparatus of claim 28, wherein the substrate includes a metallic surface and the nanowires contact the metallic surface.

37. An apparatus, comprising:

a substrate with a dielectric surface;

a plurality of freestanding nanowires in contact with the dielectric surface of the substrate, the nanowires each including copper; and

wherein the nanowires each include a respective free end, each have a first dimension of 500 nanometers or less, and each have a second dimension extending from the substrate to the respective free end, the second dimension being at least 10 times greater than the first dimension.

38. The apparatus of claim 37, wherein the substrate is comprised of silicon dioxide.

39. The apparatus of claim 37, wherein the nanowires consist essentially of copper.

40. The apparatus of claim 37, wherein the first dimension is 50 nanometers or less.

STIC Search Results Feedback Form

EIC17000

Questions about the scope or the results of the search? Contact ***the EIC searcher or contact***:

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1713*
- *Relevant prior art **found**, search results used as follows:*

  ☐ 102 rejection
  ☐ 103 rejection
  ☐ Cited as being of interest.
  ☐ Helped examiner better understand the invention.
  ☐ Helped examiner better understand the state of the art in their technology.

  Types of relevant prior art found:

  ☐ Foreign Patent(s)
  ☐ Non-Patent Literature
  (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found:***

  ☐ Results verified the lack of relevant prior art (helped determine patentability).
  ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

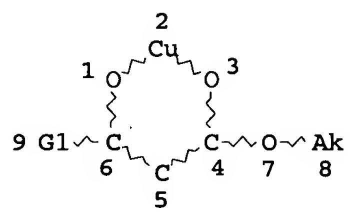
Drop off or send completed forms to EIC1700 REMSEN 4B28

```
=> fil reg
FILE 'REGISTRY' ENTERED AT 17:21:07 ON 16 NOV 2006
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.
PLEASE SEE "HELP USAGETERMS" FOR DETAILS.
COPYRIGHT (C) 2006 American Chemical Society (ACS)


=> d his nofile

     (FILE 'HOME' ENTERED AT 15:15:04 ON 16 NOV 2006)

     FILE 'HCAPLUS' ENTERED AT 15:15:14 ON 16 NOV 2006
L1             1 SEA US2005064158/PN

     FILE 'REGISTRY' ENTERED AT 15:16:20 ON 16 NOV 2006
L2             3 SEA (7440-50-8/BI OR 1344-70-3/BI OR 7782-44-7/BI)
L3             0 SEA COPPER(A)(ETHYLACETOACETATE OR ETHYL(W)ACETOACETATE)
L4             1 SEA 7440-50-8/RN

     FILE 'HCAPLUS' ENTERED AT 16:03:13 ON 16 NOV 2006
L5         26553 SEA L4/D OR L4/DP
L6        144485 SEA (L5 OR COPPER OR CU)(L)(COMPLEX? OR BIDENTAT? OR
                 TRIDENTAT? OR TETRADENTAT? OR SEQUEST? OR LIGAND?)
L7        123651 SEA CVD OR (CHEMICAL? OR CHEM)(2A)(VAPOR? OR VAPOUR?)(2A)
                 DEPOSIT? OR OMCVD OR MOCVD OR LPCVD OR PECVD OR HFCVD OR
                 ULPCVD OR PACVD OR PCVD
L8        138709 SEA NANOPARTICL? OR NANOPARTICULAT? OR NANOSCAL? OR
                 NANOCHEM? OR NANOSIZ? OR NANOTUB? OR NANOMATERIAL? OR
                 NANO(A)(PARTICL? OR PARTICULAT? OR SCAL? OR CHEM? OR
                 SIZ? OR TUB? OR MATERIAL?)
L9          5479 SEA (L4 OR COPPER OR CU)(L)L7
L10              QUE ETHYLACETOACETATE# OR ETHYL(A)ACETOACETATE#
L11              QUE 76/SC,SX

     FILE 'REGISTRY' ENTERED AT 16:36:58 ON 16 NOV 2006
L12              STR
L13           16 SEA SSS SAM L12
L14          326 SEA SSS FUL L12
                 SAV L14 STO431/A
L15           11 SEA L14 AND P/ELS

     FILE 'HCAPLUS' ENTERED AT 16:44:11 ON 16 NOV 2006
L16            7 SEA L15
L17            3 SEA L16 AND L7
L18        52767 SEA NANOSTRUCTURE? OR NANOWIR? OR NANO(A)(STRUCTURE? OR
                 WIR?)
L19          209 SEA L6 AND L18
L20            5 SEA L19 AND L7
L21            2 SEA L5 AND (L18 OR L8) AND L7
L22          177 SEA L9 AND (L18 OR L8)
L23           61 SEA L22 AND L18
L24           62 SEA L23 OR L20 OR L21
L25           24 SEA L24 AND L11

     FILE 'REGISTRY' ENTERED AT 17:02:54 ON 16 NOV 2006
                 D L14 100 FIDE
L26          464 SEA CUOC3O/ES
L27        10260 SEA CUOC3O/ESS
L28           67 SEA L26 AND P/ELS
L29          296 SEA L27 AND P/ELS
```

```
     FILE 'HCAPLUS' ENTERED AT 17:16:46 ON 16 NOV 2006
L30            0 SEA L25 AND L10
L31           24 SEA L25 NOT L17
L32           67 SEA L28
L33          164 SEA L29
L34           28 SEA (L32 OR L33) AND L7
L35            0 SEA L34 AND (L8 OR L18)
L36           25 SEA L34 NOT L17
L37           24 SEA L36 AND (1804-2003)/PY,PRY
L38           14 SEA L25 AND (1804-2003)/PY,PRY
```

0 hit on "ethylacetoacetate"

```
=> d l14 que stat
L12              STR
```



Ak @10

```
VAR G1=10/SI/O
NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS  10

STEREO ATTRIBUTES: NONE
L14          326 SEA FILE=REGISTRY SSS FUL L12

100.0% PROCESSED    3170 ITERATIONS                      326 ANSWERS
SEARCH TIME: 00.00.01


=> fil hcap
FILE 'HCAPLUS' ENTERED AT 17:21:35 ON 16 NOV 2006
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.
PLEASE SEE "HELP USAGETERMS" FOR DETAILS.
COPYRIGHT (C) 2006 AMERICAN CHEMICAL SOCIETY (ACS)


=> d l17 ibib abs hitstr hitind 1-3
```

L17 ANSWER 1 OF 3 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2000:117218 HCAPLUS
DOCUMENT NUMBER: 132:169768
TITLE: Copper acetoacetate derivatives as organometal precursors for **chemical vapor deposition**
INVENTOR(S): Choi, Hyungsoo
PATENT ASSIGNEE(S): USA
SOURCE: PCT Int. Appl., 18 pp.

CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000008225	A2	20000217	WO 1999-KR438	19990806
WO 2000008225	A3	20000511		
W: JP, KR, US				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
KR 2000013302	A	20000306	KR 1998-32069	19980806
EP 1121474	A2	20010808	EP 1999-935166	19990806
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
JP 2002522453	T2	20020723	JP 2000-563846	19990806
TW 499497	B	20020821	TW 1999-88115303	19990903
US 6538147	B1	20030325	US 2001-744619	20010125
KR 2001072258	A	20010731	KR 2001-701526	20010205

PRIORITY APPLN. INFO.: KR 1998-32069 A 19980806
WO 1999-KR438 W 19990806

OTHER SOURCE(S): MARPAT 132:169768

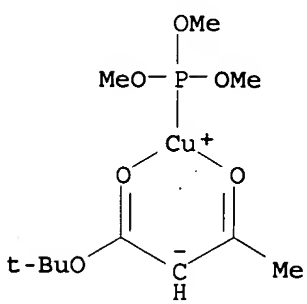
AB The organocopper compds. as volatile solids or liqs. for **chemical-vapor deposition** of Cu are acetoacetate derivs. with a neutral ligand L have the formula (R3COOCR2COR1)Cu+1(L)x with: x = 1, 2, or 3; L as phosphine, phosphite, or an unsatd. hydrocarbon; R1 and R3 as independently C1-9 alkyl or aryl, and R2 as H or C1-9 alkyl or aryl, preferably with no F. The R3 is optionally an alkylsilane group, and a stable neutral group is 1,5-dimethyl-1,5-cyclooctadiene. The organocopper compds. as **CVD** precursors show high thermal stability and volatility, and are suitable for deposition of the Cu films having nominal elec. resistivity of 1.8-2.5 μΩ-cm. The organocopper compound is typically vaporized at 15-100°, transported with a carrier gas to the substrate, and heated at 100-300° for dissociation and the deposition of Cu, especially in the presence of water vapor to increase the deposition rate, or of H2 to

decrease the impurity content in the Cu film. The precursor suitable for catalyzed coating of Si semiconductor wafers at ≥120° is (tert-Bu acetoacetato)copper(1,5-dimethyl-1,5-cyclooctadiene), but no Cu is deposited on the inert SiO_2-coated Si at 200°.

IT **211369-35-6**
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**CVD** with; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

RN 211369-35-6 HCAPLUS

CN Copper, [1,1-dimethylethyl 3-(oxo-κO)butanoato-κO'](trimethyl phosphite-κP)- (9CI) (CA INDEX NAME)



IC ICM C23C

CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 29, 76, 78

IT **Vapor deposition** process
(**chemical**, of copper; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

IT Integrated circuits
(copper films for; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

IT Ligands
RL: MOA (Modifier or additive use); USES (Uses)
(neutral, organocopper compds. with; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

IT 7440-50-8D, Copper, acetoacetate derivs., with neutral ligand, processes 211369-24-3 211369-29-8 **211369-35-6**
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**CVD** with; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

IT 7440-37-1, Argon, uses
RL: MOA (Modifier or additive use); USES (Uses)
(carrier, in **CVD**; acetoacetate organocopper derivative for **chemical vapor deposition** of Cu on semiconductor)

IT 7440-50-8, Copper, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(film, deposition of; acetoacetate organocopper derivs. as precursors for **chemical vapor deposition** of Cu)

IT 7631-86-9, Silica, processes 25583-20-4, Titanium nitride (TiN)
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(film, semiconductor with; acetoacetate organocopper derivative for **chemical vapor deposition** of Cu on semiconductor)

IT 7440-21-3, Silicon, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(semiconductor, coating of; acetoacetate organocopper derivative for **chemical vapor deposition** of Cu on semiconductor)

L17 ANSWER 2 OF 3 HCAPLUS COPYRIGHT 2006 ACS on STN

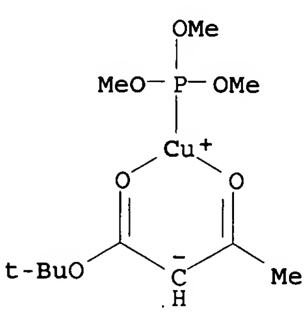
ACCESSION NUMBER: 1998:513012 HCAPLUS
DOCUMENT NUMBER: 129:178525
TITLE: Copper(I) tert-Butyl 3-oxobutanoate complexes as precursors for **chemical vapor deposition** of copper
AUTHOR(S): Choi, Hyungsoo; Hwang, Soontaik
CORPORATE SOURCE: Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, 61801, USA
SOURCE: Chemistry of Materials (1998), 10(9), 2326-2328
CODEN: CMATEX; ISSN: 0897-4756
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A series of stable volatile precursors were synthesized for **CVD** of Cu by thermally-induced disproportionation. Tert-Bu 3-oxobutanoate in complex with Cu tri-Me phosphite is especially attractive because of a wide process window, long shelf life, and easy handling.

IT **211369-35-6P**
RL: NUU (Other use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(precursors for **CVD** of copper)

RN 211369-35-6 HCAPLUS

CN Copper, [1,1-dimethylethyl 3-(oxo-κO)butanoato-κO'](trimethyl phosphite-κP)- (9CI) (CA INDEX NAME)



CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 78

ST copper **CVD** precursor oxobutanoate complex

IT **Vapor deposition** process
(**chemical**; copper(I) tert-Bu 3-oxobutanoate complexes as precursors for **CVD** of copper)

IT 211369-21-0P 211369-24-3P 211369-26-5P 211369-29-8P

211369-32-3P 211369-34-5P **211369-35-6P**
RL: NUU (Other use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(precursors for **CVD** of copper)

IT 7440-50-8, Copper, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(tert-Bu 3-oxobutanoate complexes as precursors for **CVD** of copper)

REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L17 ANSWER 3 OF 3 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1995:795373 HCAPLUS
DOCUMENT NUMBER: 123:242602
TITLE: Method for the production of highly pure copper thin films by **chemical vapor deposition**
INVENTOR(S): Choi, Hyung S.; Cho, Young S.; Lim, Chong J.; Hwang, Soon T.
PATENT ASSIGNEE(S): Korea Institute of Science and Technology, S. Korea
SOURCE: U.S., 4 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION: .

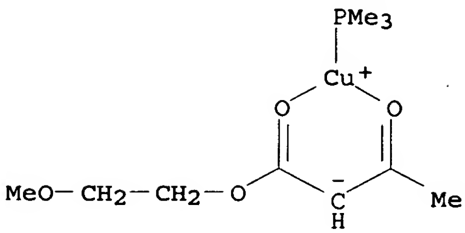
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5441766	A	19950815	US 1994-295423	19940825

PRIORITY APPLN. INFO.: US 1994-295423 19940825

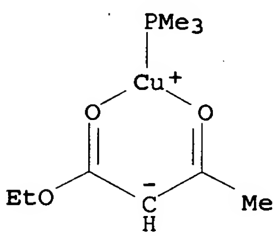
AB The present invention relates to a method for the production of highly pure copper thin films free from carbonaceous impurities, which comprises depositing a thin copper film using an organic copper compound precursor containing ketoesters alone or in combination with a Lewis base as ligands, by which the ligands are not thermally decomposed during the vapor deposition.

IT **168971-98-0 168972-00-7**
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(**CVD** for production of highly pure copper thin films using organic copper compound)

RN 168971-98-0 HCAPLUS
CN Copper, (2-methoxyethyl 3-oxobutanoato)(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 168972-00-7 HCAPLUS
CN Copper, (ethyl 3-oxobutanoato-O1',O3)(trimethylphosphine)- (9CI)
(CA INDEX NAME)



IC ICM C23C016-18
INCL 427250000
CC 75-1 (Crystallography and Liquid Crystals)
ST copper film **chem vapor deposition**; org
copper compd **CVD** copper film
IT Hydrogenation
(**CVD** for the production of highly pure copper thin films by
hydroredn. of organic copper compound)
IT Redistribution reaction
(**CVD** for the production of highly pure copper thin films by
redistribution reaction of copper organic compound)
IT Vapor deposition processes
(**CVD** for the production of highly pure copper thin films
using organic copper compound)
IT Lewis bases
RL: NUU (Other use, unclassified); USES (Uses)
(**CVD** for the production of highly pure copper thin films
using organic copper compound containing Lewis base ligand)
IT 7440-50-8P, Copper, processes
RL: IMF (Industrial manufacture); PEP (Physical, engineering or
chemical process); PREP (Preparation); PROC (Process)
(**CVD** for production of highly pure copper thin films using
organic copper compound)
IT 14284-06-1 15556-36-2 23670-45-3 25442-29-9 71724-13-5
168971-96-8 168971-97-9 **168971-98-0** 168971-99-1
168972-00-7 168972-01-8 168972-02-9
RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
PROC (Process); RACT (Reactant or reagent)
(**CVD** for production of highly pure copper thin films using
organic copper compound)

```
=> d l38 ibib abs hitstr hitind 1-14

L38  ANSWER 1 OF 14  HCAPLUS  COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER:         2005:588539  HCAPLUS
DOCUMENT NUMBER:          143:108156
TITLE:                    Method and system for forming a film of material
                          using plasmon assisted chemical reactions
INVENTOR(S):              Boyd, David A.; Brongersma, Mark; Greengard,
                          Leslie
PATENT ASSIGNEE(S):       California Institute of Technology, USA
SOURCE:                   PCT Int. Appl., 44 pp.
                          CODEN: PIXXD2
DOCUMENT TYPE:            Patent
LANGUAGE:                 English
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:

     PATENT NO.          KIND    DATE        APPLICATION NO.          DATE
     ---------------     ----    --------    --------------------
     --------
     WO 2005060634        A2     20050707    WO 2004-US41831
                                                                  200412
                                                                  14
                                                <--
     WO 2005060634        A3     20060216
         W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA,
             CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
             GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP,
             KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
             MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
             SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
             VC, VN, YU, ZA, ZM, ZW, SM
         RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW,
             AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ,
             DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC,
             NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA,
             GN, GQ, GW, ML, MR, NE, SN, TD, TG
     US 2005233078        A1     20051020    US 2004-6457
                                                                  200412
                                                                  06
                                                <--
     CA 2545700           AA     20050707    CA 2004-2545700
                                                                  200412
                                                                  14
                                                <--
     US 2005202185        A1     20050915    US 2004-12393
                                                                  200412
                                                                  14
                                                <--
     EP 1694882           A2     20060830    EP 2004-818014
                                                                  200412
                                                                  14
                                                <--
         R:  AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC,
             PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU,
             PL, SK, BA, HR, IS, YU
PRIORITY APPLN. INFO.:                       US 2003-529869P      P
                                                                  200312
                                                                  15
                                                <--
```

US 2004-6457 A 20041206

US 2004-632919P P 20041202

WO 2004-US41831 W 20041214

AB A method for forming a film of material using CVD. The method includes providing a substrate comprising a pattern of at least one metallic **nanostructure**, which is made of a selected material. The method includes determining a plasmon resonant frequency of the selected material of the **nanostructure** and exciting a portion of the selected material using an electromagnetic source having a predetd. frequency at the plasmon resonant frequency to cause an increase in thermal energy of the selected material. The method includes applying one or more chemical precursors overlying the substrate including the selected material excited at the plasmon resonant frequency and causing selective deposition of a film overlying at least the portion of the selected material.

IT **7440-50-8, Copper**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**CVD** method and system for forming film of material using excited-plasmon assisted chemical reactions)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C23C

CC **76-14** (Electric Phenomena)
Section cross-reference(s): 48, 74

ST plasmon CVD metal **nanostructure** fabrication

IT Electromagnetic wave
Electronic device fabrication
Ferroelectric films
Laser radiation
Nanostructures
Plasmon
(CVD method and system for forming film of material using excited-plasmon assisted chemical reactions)

IT 7429-90-5, Aluminum, processes 7439-88-5, Iridium, processes 7439-89-6, Iron, processes 7440-02-0, Nickel, processes 7440-05-3, Palladium, processes 7440-06-4, Platinum, processes 7440-16-6, Rhodium, processes 7440-22-4, Silver, processes 7440-32-6, Titanium, processes **7440-50-8, Copper**, processes 7440-57-5, Gold, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**CVD** method and system for forming film of material using excited-plasmon assisted chemical reactions)

L38 ANSWER 2 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2005:259405 HCAPLUS
DOCUMENT NUMBER: 142:327832
TITLE: **Nanostructures** including a metal
INVENTOR(S): Choi, Hyungsoo
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 14 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005064158	A1	20050324	US 2003-664431	20030919
WO 2005048297	A2	20050526	WO 2004-US29232	20040909 <--
WO 2005048297	A3	20060216		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2003-664431 A 20030919 <--

OTHER SOURCE(S): MARPAT 142:327832

AB One embodiment includes noncatalyticly forming a **nanowire** on a substrate from an organometallic vapor without application of any type of reduction agent. The **nanowire** is grown during this formation in a direction away from the substrate and is freestanding during growth. The **nanowire** has a 1st dimension of 500 nm or less and a 2nd dimension extending from the substrate to a free end of the **nanowire** at least 10 times greater than the 1st dimension. In one form, the organometallic vapor includes Cu and the **nanowire** essentially consists of elemental Cu, a Cu alloy, or oxide of Cu. Alternatively or addnl., the **nanowire** is of a monocryst. structure.

IT **7440-50-8D, Copper, complexes**
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fabrication of **nanostructures** including metal by **OMCVD**)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT **7440-50-8P, Copper**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(fabrication of **nanostructures** including metal by **OMCVD**)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C23C016-00
ICS B32B015-00; B32B003-00
INCL 428209000; 427252000; 977-DIG.001
CC **76-14** (Electric Phenomena)
Section cross-reference(s): 48, 74, 79
ST **nanowire** metal composite fabrication **OMCVD**
IT Integrated circuits
Nanowires
Optical imaging devices
Sensors
(fabrication of **nanostructures** including metal by **OMCVD**)
IT Vapor deposition process
(metalorg.; fabrication of **nanostructures** including metal by **OMCVD**)
IT **7440-50-8D, Copper, complexes**
7782-44-7, Oxygen, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fabrication of **nanostructures** including metal by **OMCVD**)
IT **7440-50-8P, Copper**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(fabrication of **nanostructures** including metal by **OMCVD**)
IT 1344-70-3P, **Copper** oxide
RL: SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(fabrication of **nanostructures** including metal by **OMCVD**)

L38 ANSWER 3 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2004:345248 HCAPLUS
DOCUMENT NUMBER: 142:166251
TITLE: 130-Nm process technology integration of advanced **Cu/CVD** low k dielectric material - case study of failure analysis and yield enhancement

AUTHOR(S): Tsang, C. F.; Su, Y. J.; Bliznetsov, V. N.; Ang, G. T.
CORPORATE SOURCE: Institute of Microelectronics, Science Park II, 117685, Singapore
SOURCE: Proceedings of the International Symposium on the Physical & Failure Analysis of Integrated Circuits, 10th, July 7-11, 2003 (**2003**), 63-68. Editor(s): Ho, Philip. Institute of Electrical and Electronics Engineers: New York, N. Y.
CODEN: 69FHRW; ISBN: 0-7803-7722-2
DOCUMENT TYPE: Conference
LANGUAGE: English
AB The authors reported the failure anal. of 130-nm **Cu/ CVD** low k film back-end-of-line (BEOL) process and successfully identified the root causes of failures leading to elec. yield loss of the process. The authors also demonstrated the significant yield enhancements through (a) optimization of via and trench etch recipes and post-etch clean condition, (b) tightened defectivity control and (c) in-line monitoring control.

IT **7440-50-8, Copper**, processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC **76-2** (Electric Phenomena)
Section cross-reference(s): 48

ST failure **copper CVD** low const dielec via **nanostructure** fabrication

IT **Vapor deposition** process
(**chemical**; failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

IT Electric failure
Semiconductor device fabrication
Semiconductor **nanostructures**
(failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

IT Cleaning
Etching
Process control
(failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes with)

IT Antireflective films
(forming via; failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

IT Electric resistance
Leakage current
(in failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

IT Dielectric films
(low-κ; failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)

IT Vapor deposition process
(plasma; failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)
IT Interconnections, electric
(vias; failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)
IT 409-21-2, Silicon carbide (SiC), processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(barrier for interconnect; failure of **copper/ CVD** low-κ dielec. films in **nanostructure** processes)
IT **7440-50-8, Copper**, processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(failure of **copper/CVD** low-κ dielec. films in **nanostructure** processes)
IT 139763-37-4, Silicon carbide hydride oxide
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(low-κ dielec. film; failure of **copper/ CVD** low-κ dielec. films in **nanostructure** processes)
REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 4 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:859884 HCAPLUS
DOCUMENT NUMBER: 140:85775
TITLE: Field emission from amorphous-carbon nanotips on copper
AUTHOR(S): Huang, C. J.; Chih, Y. K.; Hwang, J.; Lee, A. P.; Kou, C. S.
CORPORATE SOURCE: Department of Materials Science and Engineering, National Tsing Hua University, Taichung, Taiwan
SOURCE: Journal of Applied Physics (**2003**), 94(10), 6796-6799
CODEN: JAPIAU; ISSN: 0021-8979
PUBLISHER: American Institute of Physics
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Amorphous carbon (a-C) nanotips were directly grown on **copper** substrates by microwave plasma-enhanced **chem .-vapor deposition.** The length of a typical a-C nanotip is .apprx.250 nm, and its tip diameter is .apprx.25 nm. The in-plane correlation length La, equivalent to the size of the sp2 clusters, is determined to be 1.2 nm through the intensity ratio of the D and G peaks in the Raman spectrum, which is about in the optimum range for field emission. A low turn-on field of 1.6 V/μm at 10 μA/cm2, a threshold field of 3.8 V/μm at 10 mA/cm2, and a high c.d. of 32.42 mA/cm2 at 4.0 V/μm are achieved. The field emission characteristics of a-C nanotips are close to those of carbon **nanotubes**, and much better than what has been reported for flat diamond-like carbon or a-C:H coated cathodes. The roles of the sp2 cluster size, electron confinement, and conductivity in the field emission of a-C nanotips are discussed.

CC **76-12** (Electric Phenomena)
IT **Nanostructures**
(nanotips; field emission from amorphous-carbon nanotips on copper)
REFERENCE COUNT: 26 THERE ARE 26 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 5 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:692018 HCAPLUS
DOCUMENT NUMBER: 139:367982
TITLE: Polycrystalline **copper** wires and networks with 100 nanometer radius observed in **MOCVD**
AUTHOR(S): Chang, Yuneng; Chen, Yalian; Wu, Ruykuo; Chen, Kuanhon; Lin, Johnyi
CORPORATE SOURCE: Dept. of Chemical Engineering, Lunghwa University of Science and Technology, Taoyuan, 333, Taiwan
SOURCE: Proceedings - Electrochemical Society (**2003**), 2003-8(Chemical Vapor Deposition XVI and EUROCVD 14, Volume 2), 1182-1189
CODEN: PESODO; ISSN: 0161-6374
PUBLISHER: Electrochemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Using **copper** acetylacetonate and water vapor as reactants, with chromium acetylacetonate as growth catalyst, depositions of **copper nanowires** and network were observed in an atmospheric pressure **CVD** at temps. from 380 to 440 °C. These **nanostructures** are polycryst. **Cu**(111) and (200), with helical and spiral shape. Comparison expts. indicated that it was water vapor that initiated nucleation of **Cu** islands. Adding chromium acetylacetonate accelerated the linear growth rate. A vapor-liquid-solid (VLS) model involving BCF theory was proposed to describe the governing mechanism for the axial growth. Surface properties of substrate have profound impact on growth pattern. For **Cu CVD** on Si(100) substrate, one dimensional **Cu** wires, with radii from 90 to 240 nm, lengths from 103 to 104 nm, and distribution d. of 0.20-3.6 one/μm2, were observed For **CVD** on pre-sputtered **Cu** surface at same condition, **Cu** networks with three dimension cross-link structures, were observed The radii of **Cu** branches were from 80 to 300 nm. This was attributed to catalytic force by pre-sputtered **Cu** buffer layer, which alters growth habit of **Cu nanowires.**
IT **7440-50-8P**, **Copper**, preparation
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC 56-6 (Nonferrous Metals and Alloys)

Section cross-reference(s): **76**

ST **copper nanowire chem vapor deposition**

IT **Vapor deposition** process
(**chemical**, metallorg.; polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)

IT **Nanowires**
(polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)

IT Nanocrystalline metals
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)

IT **7440-50-8P, Copper**, preparation
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)

IT 7440-21-3, Silicon, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
(substrate; polycryst. **copper** wires and networks with 100 nm radius prepared by in metallorg. **CVD**)

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 6 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:874220 HCAPLUS
DOCUMENT NUMBER: 138:229389
TITLE: **Chemical vapor deposition** of coatings
AUTHOR(S): Choy, K. L.
CORPORATE SOURCE: Department of Materials, Technology and Medicine, Imperial College of Science, London, SW7 2BP, UK
SOURCE: Progress in Materials Science (**2003**), 48(2), 57-170
CODEN: PRMSAQ; ISSN: 0079-6425
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal; General Review
LANGUAGE: English

AB A review. **Chemical vapor deposition** (**CVD**) of films and coatings involve the chemical reactions of gaseous reactants on or near the vicinity of a heated substrate surface. This atomistic deposition method can provide highly pure materials with structural control at atomic or nanometer scale level. Moreover, it can produce single layer, multilayer, composite, **nanostructured**, and functionally graded coating materials with well controlled dimension and unique structure at low processing temps. Furthermore, the unique feature of **CVD** over other deposition techniques such as the non-line-of-sight-deposition capability has allowed the coating of **complex** shape engineering components and the fabrication of nano-devices, carbon-carbon (C-C) composites, ceramic matrix composite (CMCs),

free standing shape components. The versatility of **CVD** had led to rapid growth and it has become one of the main processing methods for the deposition of thin films and coatings for a wide range of applications, including semiconductors (e.g. Si, Ge, Si1-xGex, III-V, II-VI) for microelectronics, optoelectronics, energy conversion devices; dielecs. (e.g. SiO2, AlN, Si3N4) for microelectronics; refractory ceramic materials (e.g. SiC, TiN, TiB2, Al2O3, BN, MoSi2, ZrO2) used for hard coatings, protection against corrosion, oxidation or as diffusion barriers; metallic films (e.g. W, Mo, Al, Au, **Cu**, Pt) for microelectronics and for protective coatings; fiber production (e.g. B and SiC monofilament fibers) and fiber coating. This contribution aims to provide a brief overview of **CVD** of films and coatings. The fundamental aspects of **CVD** including process principle, deposition mechanism, reaction chemical, thermodn., kinetics, and transport phenomena will be presented. In addition, the practical aspects of **CVD** such as the **CVD** system and apparatus used, **CVD** process parameters, process control techniques, range of films synthesized, characterization and co-relationships of structures and properties will be presented. The advantages and limitations of **CVD** will be discussed, and its applications will be briefly reviewed. The article will also review the development of **CVD** technologies based on different heating methods, and the type of precursor used which has led to different variants of **CVD** methods including thermally activated **CVD**, plasma enhanced **CVD**, photo-assisted **CVD**, atomic layer epitaxy process, metalorg. assisted **CVD**. There are also variants such as fluidized-bed **CVD** developed for coating powders; electrochem. vapor deposition for depositing dense films onto porous substrates; chemical vapor infiltration for the fabrication of C-C composites, and CMCs through the deposition and densification of ceramic layers onto porous fiber preforms. The emerging cost-effective **CVD** -based techniques such as electrostatic-aerosol assisted **CVD** and flame assisted **CVD** will be highlighted. The scientific and technol. significance of these different variants of **CVD** will be discussed and compared with other vapor processing techniques such as phys. vapor deposition.

CC 75-0 (Crystallography and Liquid Crystals)
Section cross-reference(s): 57, **76**

ST review **CVD** film coating

IT Ceramic coatings
Coating materials
Dielectric films
Films
Semiconductor films
(**chemical vapor deposition** of films and coatings)

IT Metals, properties
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**chemical vapor deposition** of films and coatings)

IT **Vapor deposition** process
(**chemical; chemical vapor deposition** of films and coatings)

REFERENCE COUNT: 422 THERE ARE 422 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 7 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:823950 HCAPLUS
DOCUMENT NUMBER: 138:145497
TITLE: **Nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process
AUTHOR(S): Pauleau, Y.; Thiery, F.
CORPORATE SOURCE: CNRS-UJF-LEMD, National Polytechnic Institute of Grenoble, Grenoble, 38042, Fr.
SOURCE: Materials Letters (**2002**), 56(6), 1053-1058
CODEN: MLETDJ; ISSN: 0167-577X
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Pure **copper** and **copper**-carbon composite films have been deposited on silicon substrates by sputtering of a **copper** target associated with microwave plasma-enhanced **chemical vapor deposition (PECVD)** process of carbon from argon-methane mixts. of various compns. The composition of films determined by Rutherford backscattering spectroscopy (RBS), the crystallog. structure identified by X-ray diffraction (XRD) techniques, the deposition rate deduced from the film thickness, and the elec. resistivity of films obtained by four point probe measurements were investigated as functions of the methane concentration in the argon-methane gas phase. **Copper**-carbon composite films containing 20-75 atomic% of carbon were produced as the CH4 concentration was varied from 10% to 100%. A large increase (from 25 to 60 atomic%) in carbon content in the films was observed as the CH4 concentration in the gas phase increased from 60% to 70%. These composite films consisted of polycryst. **copper** and amorphous carbon phase. The **copper** crystallite size was in the range 15-30 nm and less than 5 nm for a carbon content in **Cu**-C films ranging from 20 to 25 atomic% and from 60 to 75 atomic%, resp. The elec. resistivity of **Cu**-C films containing 20-25 atomic% of carbon was approx. 2.5 μΩ cm whereas the resistivity value can reach 107 μΩ cm for films containing 60-75 atomic% of carbon. A large variation of grain size and elec. resistivity of **nanostructured Cu**-C composite thin films was noticed as the CH4 concentration in the gas phase was varied from 60% to 70%.

IT **7440-50-8, Copper**, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC **76-1** (Electric Phenomena)
Section cross-reference(s): 66
IT Electric resistance
Grain size

Nanocomposites
Nanostructures
Sputtering
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT Vapor deposition process
(plasma; **nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT 7440-37-1, Argon, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT **7440-50-8, Copper**, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT 7440-44-0P, Carbon, properties
RL: PNU (Preparation, unclassified); PRP (Properties); PREP (Preparation)
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT 74-82-8, Methane, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)
IT 7440-21-3, Silicon, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(substrate; **nanostructured copper**-carbon composite thin films produced by sputter deposition/microwave plasma-enhanced **chemical vapor deposition** dual process)

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 8 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:66865 HCAPLUS
DOCUMENT NUMBER: 136:126886
TITLE: **MOCVD** precursors based on organometalloid ligands
INVENTOR(S): Welch, John T.; Banger, Kulbinder Kumar; Higashiya, Seiichiro; Ngo, Silvana C.
PATENT ASSIGNEE(S): Research Foundation of State University of New York, USA
SOURCE: U.S., 12 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

```
PATENT NO.          KIND   DATE        APPLICATION NO.       DATE
---------------     ----   --------    --------------------
--------
US 6340768           B1    20020122    US 2000-728998
                                                             200012
                                                             04
                                             <--
WO 2002046200        A1    20020613    WO 2001-US46327
                                                             200112
                                                             04
                                             <--
    W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH,
        CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD,
        GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,
        LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
        NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,
        TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG,
        KZ, MD, RU, TJ, TM
    RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE,
        CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT,
        SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE,
        SN, TD, TG
AU 2002028780        A5    20020618    AU 2002-28780
                                                             200112
                                                             04
                                             <--
PRIORITY APPLN. INFO.:                 US 2000-728998      A
                                                             200012
                                                             04
                                             <--
                                       WO 2001-US46327     W
                                                             200112
                                                             04
                                             <--
```

OTHER SOURCE(S): MARPAT 136:126886

AB Volatile metal **complexes** with α-sila-β-diketonate **ligands** containing haloalkyl, and particularly, perfluoroalkyl, substituents are useful as metal precursors for **CVD** processes and as **nanostructured** materials containing fluorous domains. For example **Cu**(Me3CCOCHCOSiMe3)2 was prepared, its volatility studied and was used as precursor in **CVD** of **Cu** films.

IT **7440-50-8**, **Copper**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(metalorg. **CVD** using **copper** silyl diketonate precursor)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C07F007-02
ICS C07F001-08; C07F001-10; C07F015-06; C23C016-00

INCL 556012000

CC 75-11 (Crystallography and Liquid Crystals)
Section cross-reference(s): **76**, 78

ST metalorg **CVD** precursor prepn volatility; **copper** metalorg **CVD** precursor prepn volatility; silyl ketonate **copper complex** prepn volatility precursor **CVD**; germyl ketonate **copper complex** prepn volatility precursor **CVD**

IT Thermal properties
Volatility
(of metalorg. compds. as precursors for **CVD** and other chemical processes)

IT Coordination compounds
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal properties of metalorg. compds. as precursors for **CVD** and other chemical processes)

IT 7439-92-1DP, Lead, plumbyl diketones or thiodiketones, metal complexes 7440-06-4DP, Platinum, organic complexes 7440-31-5DP, Tin, stannyl diketones or thiodiketones, metal complexes
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**MOCVD** precursors)

IT **7440-50-8**, **Copper**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(metalorg. **CVD** using **copper** silyl diketonate precursor)

IT 375855-16-6P 390802-76-3P
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation and **complexation** with **copper**)

IT 375855-17-7P 390802-67-2P 390802-68-3P 390802-69-4P 390802-70-7P 390802-71-8P 390802-72-9P 390802-73-0P 390802-74-1P 390802-75-2P 390803-38-0P
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal properties as precursor for **CVD** and other chemical processes)

IT 286854-86-2P 286854-87-3P 390802-77-4P
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and volatility as precursor for **CVD** and other chemical processes)

IT 286854-92-0P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation as precursor for **CVD**)

IT 286854-93-1P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation as precursor for **CVD** and other chemical processes)

IT 286854-75-9 286854-76-0 286854-77-1 286854-78-2 286854-79-3
286854-80-6 286854-81-7 286854-82-8 286854-83-9 390802-78-5
390802-79-6 390802-80-9 390802-81-0 390802-82-1 390802-83-2
390802-84-3 390802-85-4 390802-86-5 390802-87-6 390802-88-7
390802-89-8 390802-90-1 390802-91-2 390802-92-3 390802-93-4
390802-94-5 390802-95-6 390802-96-7 390802-97-8 390802-98-9
390802-99-0 390803-00-6 390803-01-7 390803-02-8 390803-03-9
390803-04-0 390803-05-1 390803-06-2 390803-07-3 390803-08-4
390803-09-5 390803-10-8 390803-11-9 390803-12-0 390803-13-1
390803-14-2 390803-15-3 390803-16-4 390803-17-5 390803-18-6
390803-19-7 390803-20-0 390803-21-1 390803-22-2 390803-23-3
390803-24-4 390803-25-5 390803-26-6 390803-27-7 390803-28-8
390803-29-9 390803-30-2 390803-31-3 390803-32-4 390803-33-5

390803-34-6 390803-35-7 390803-36-8 390803-37-9
RL: PRP (Properties)
(thermal properties as precursor for **CVD** and other chemical processes)
IT 286854-84-0 286854-85-1
RL: PRP (Properties)
(volatility as precursor for **CVD** and other chemical processes)
REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 9 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2001:935150 HCAPLUS
DOCUMENT NUMBER: 136:394767
TITLE: Synthesis and characterization of carbon **nanotubes**
AUTHOR(S): Ritschel, Manfred; Bartsch, Karl; Leonhardt, Albrecht; Graff, Andreas; Taschner, Christine; Fink, Jorg
CORPORATE SOURCE: IFW Dresden, Institute for Solid State Research, Dresden, D-01069, Germany
SOURCE: AIP Conference Proceedings (**2001**), 591(Electronic Properties of Molecular Nanostructures), 163-166
CODEN: APCPCS; ISSN: 0094-243X
PUBLISHER: American Institute of Physics
DOCUMENT TYPE: Journal
LANGUAGE: English
OTHER SOURCE(S): CASREACT 136:394767

AB The catalytic CVD (CCVD) is a very promising process with respect to large scale production of different kinds of carbon **nanostructures**. By modifying the deposition temperature, the catalyst material and the hydrocarbon nanofibers with herringbone structure, multi-walled **nanotubes** with tubular structure and single-walled **nanotubes** were deposited. Also, layers of aligned multi-walled **nanotubes** could be obtained on oxidized silicon substrates coated with thin sputtered metal layers (Co, permalloy) as well as onto WC-Co hardmetals by using the microwave assisted plasma CVD process (MWCVD). The obtained carbon modifications were characterized by scanning (SEM) and transmission (TEM) electron microscopy. The hydrogen storage capability of the nanofibers and **nanotubes** and the electron field emission of the **nanotube** layers was investigated.

IT **7440-50-8, Copper**, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst for preparation of carbon **nanotubes** by catalytic **CVD**)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC 78-1 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 57, **76**
ST carbon **nanotube** CVD prepn field emission
IT **Nanotubes**
(carbon; preparation of carbon **nanotubes** by catalytic CVD)

```
IT   Vapor deposition process
        (chemical; preparation of carbon nanotubes by catalytic CVD)
IT   Field emission
        (of layered carbon nanotubes prepared by microwave
        assisted plasma CVD)
IT   Vapor deposition process
        (plasma; preparation of layered carbon nanotubes by
        microwave assisted plasma CVD)
IT   102-54-5, Ferrocene   7439-89-6, Iron, uses 7440-50-8,
     Copper, uses
     RL: CAT (Catalyst use); USES (Uses)
        (catalyst for preparation of carbon nanotubes by catalytic
        CVD)
IT   7440-48-4, Cobalt, uses   11068-82-9, Permalloy   12637-47-7
     RL: CAT (Catalyst use); USES (Uses)
        (catalyst for preparation of carbon nanotubes by catalytic
        CVD or microwave assisted plasma CVD)
IT   7440-44-0P, Carbon, preparation
     RL: PEP (Physical, engineering or chemical process); PRP
     (Properties); PYP (Physical process); SPN (Synthetic preparation);
     PREP (Preparation); PROC (Process)
        (preparation of carbon nanotubes by catalytic CVD)
IT   71-43-2, Benzene, reactions   74-85-1, Ethylene, reactions
     RL: RCT (Reactant); RACT (Reactant or reagent)
        (reactant for preparation of carbon nanotubes by catalytic
        CVD)
IT   74-82-8, Methane, reactions
     RL: RCT (Reactant); RACT (Reactant or reagent)
        (reactant for preparation of carbon nanotubes by catalytic
        CVD or microwave assisted plasma CVD)
REFERENCE COUNT:          6     THERE ARE 6 CITED REFERENCES AVAILABLE FOR
                                THIS RECORD. ALL CITATIONS AVAILABLE IN
                                THE RE FORMAT

L38  ANSWER 10 OF 14  HCAPLUS  COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER:         2001:137129  HCAPLUS
DOCUMENT NUMBER:          134:172030
TITLE:                    Ultrathin copper nanostructure
                          laminate with high adhesion for electronic
                          devices
INVENTOR(S):              Hunt, Andrew Tye; Luten, Henry A., III
PATENT ASSIGNEE(S):       Microcoating Technologies, Inc., USA
SOURCE:                   PCT Int. Appl., 24 pp.
                          CODEN: PIXXD2
DOCUMENT TYPE:            Patent
LANGUAGE:                 English
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:

     PATENT NO.          KIND    DATE          APPLICATION NO.         DATE
     ---------------     ----    --------      --------------------
     --------
     WO 2001012433        A2     20010222      WO 2000-US22845
                                                                       200008
                                                                       17
                                                          <--
     WO 2001012433        A3     20010907
         W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH,
             CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH,
             GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
```

```
          LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ,
          PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ,
          UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU,
          TJ, TM
      RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH,
          CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE,
          BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
    US 6372364          B1     20020416    US 1999-376625
                                                                 199908
                                                                 18
                                                <--
    EP 1218113          A2     20020703    EP 2000-955757
                                                                 200008
                                                                 17
                                                <--
      R:  AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, MC, IE,
          SI, LT, LV, FI, RO, MK, CY, AL
    BR 2000013378       A      20020730    BR 2000-13378
                                                                 200008
                                                                 17
                                                <--
PRIORITY APPLN. INFO.:                     US 1999-376625      A
                                                                 199908
                                                                 18
                                                <--
                                           WO 2000-US22845     W
                                                                 200008
                                                                 17
                                                <--
```

AB A thin film product having a **nanostructured** surface, a laminate product including the thin film and a temporary substrate opposite the **nanostructured** surface, a laminate product including the thin film and a final substrate attached to the **nanostructured** surface and a method of producing the thin film products. The thin film is particularly useful in the electronics industry for the production of integrated circuits, touch screen, flat panel display, printed circuit boards and EMF shielding. The **nanostructured** surface includes surface features that are mostly smaller than one micron, while the dense portion of the thin film is between 10-200 mm. The thin film is produced by coating a temporary substrate (such as aluminum foil) with a coating material (such as **copper**) using any process. One such method is concentrated heat deposition or a combustion, **chemical vapor deposition** process. The resulting thin film provides a high level of adhesion to a final substrate, by embedding the **nanostructures** with the material of the final substrate (such as epoxy resin). The surface of the thin film adjacent the temporary substrate substantially conforms to the substrate surface and has a relatively low peel strength. In this manner, the temporary substrate is easily removed from the thin film after attaching the opposite **nanostructured** side of the thin film to the final substrate with a resulting, higher peel strength.

IC ICM B32B015-00

CC **76-14** (Electric Phenomena)
Section cross-reference(s): 42, 56, 74

ST ultrathin copper **nanostructure** laminate high adhesion electronic device

IT Coating process
(constant heat; ultrathin copper **nanostructure** laminate

with high adhesion for electronic devices)
IT Films
(elec. conductive; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Electric conductors
(films; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Epoxy resins, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(final substrate; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Optical imaging devices
(flat panel; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Materials
(organic, temporary substrate; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Coating materials
(peelable; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Coating materials
(scratch-resistant; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT Adhesion, physical
Electric circuits
Electromagnetic shields
Electronic device fabrication
Glass substrates
Integrated circuits
Laminated materials
Lamination
Nanostructures
Printed circuit boards
Semiconductor device fabrication
Ultrathin films
(ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT 1344-28-1, Aluminum oxide, uses
RL: NUU (Other use, unclassified); USES (Uses)
(releasing agent; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT 7429-90-5, Aluminum, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); REM (Removal or disposal); PROC (Process); USES (Uses)
(temporary substrate; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT 7440-02-0, Nickel, uses
RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(temporary substrate; ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)
IT 7440-50-8P, Copper, processes
RL: PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(ultrathin copper **nanostructure** laminate with high adhesion for electronic devices)

L38 ANSWER 11 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1999:227095 HCAPLUS
DOCUMENT NUMBER: 130:345348
TITLE: Growth of thin oxide films by MOCVD technique
AUTHOR(S): Weiss, F.; Senateur, J. P.; Dubourdieu, C.; Galindo, V.; Lindner, J.
CORPORATE SOURCE: LMGP-ENSPG, UMR CNRS 5628, Saint Martin d'Heres, 38402, Fr.
SOURCE: Vide: Science, Technique et Applications (**1998**), 289, 561-567
CODEN: VSTAFH; ISSN: 1266-0167
PUBLISHER: Societe Francaise du Vide
DOCUMENT TYPE: Journal; General Review
LANGUAGE: French

AB A review with 12 refs. In recent years, the possibility to grow High Temperature Superconducting (HTS) or ferroelec. oxide films by **MOCVD** techniques was demonstrated by several authors. These oxide layers (essentially YBa2Cu3O7, BaTiO3, SrTiO3, ...) can be used in the field of microelectronics (memories, microwave, antennas, squids, bolometers, ...) but also, with an emerging interest today, in high current devices (wires, tapes, ...). For all these applications **MOCVD** can be attractive, if the growth process can be sufficiently controlled to ensure a good homogeneity and reproducibility in the produced layers, but also if high growth rates can be reached. Under these conditions, the advantages of **MOCVD** are manifold: good growth control, deposition on nonplanar objects, rather inexpensive set-up compatible with an industrial environment. Nevertheless, during a long time, the lack of suitable precursor materials (for Ba essentially) was detrimental for the rapid development of **MOCVD** and, despite several important developments in the chemical of novel precursors [2,3], only limited evaporation rates and a poor stability can be reached today. Most of the metalorg. precursors used belong to the -diketonate family, with an extensive use of Y(tmhd)3, Ba(tmhd)2 and **Cu**(tmhd)2. The precursors for Y and **Cu** have reasonable volatility and stability at moderate temps. (around 100°). Only Ba(tmhd)2 has to be heated to temps. >200°, which affects its long term vaporization stability. Oligomerization can occur which decreases volatility, leading to a compositional shift in the gas phase and in the film during oxide deposition. The evaporation temperature for Ba must therefore be very precisely controlled and kept relatively low, thus reducing the maximum available Ba partial pressure into the deposition zone and limiting the growth rate by mass transport towards the substrate. To increase the stability of Chemical Vapor reactions and to improve the growth rate in the deposition process, alternative **MOCVD** techniques thought been developed in the last years. These processes are largely described in the present paper and carefully analyzed in terms. of Chemical reaction pathways and exptl. parameter dependence. There fundamental principle is based on the evaporation of Mixed Liquid Sources, where the metalorg. precursors are associated which suitable solvent and conditioned in small droplets with a controlled size. The main advantage of the Mixed Liquid Source (MLS) **MOCVD**, against conventional **MOCVD**, is that metal-organic precursors are exposed to elevated temps. only during the short time necessary for their evaporation The composition control and the reproducibility of the process are therefore substantially improved. Also, the Mixed Liquid Source **CVD** process, due to the possibility to transport a large amount of precursors to the

preheating zone, yields higher partial pressures of the reacting species in the gas phase and, consequently, gives rise to an improved growth rate. The dominating technique is actually computer-controlled injection **MOCVD.** This technique was used for the synthesis of various functional oxides and for the growth of multilayered **nanostructures.**

CC **76-0** (Electric Phenomena)
Section cross-reference(s): 75

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 12 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1998:685013 HCAPLUS
DOCUMENT NUMBER: 129:283823
TITLE: Method of forming metallic and ceramic thin film structures using metal halides and alkali metals
INVENTOR(S): Hendricks, Jay H.; Zachariah, Michael R.
PATENT ASSIGNEE(S): U.S. Dept. of Commerce National Institute of Standards and Technology, USA
SOURCE: PCT Int. Appl., 51 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
WO 9844164	A1	19981008	WO 1998-US6644		19980403 <--
W: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, GW, HU, ID, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UZ, VN, YU, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM					
RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG					
AU 9873577	A1	19981022	AU 1998-73577		19980403 <--
US 6113983	A	20000905	US 1998-54401		19980403 <--
PRIORITY APPLN. INFO.:			US 1997-41965P	P	19970403 <--
			US 1997-61443P	P	19971009 <--
			WO 1998-US6644	W	19980403

<--

AB A new low temperature method for **nanostructured** metal and ceramic thin film growth by **CVD** involves the use of a low pressure co-flow diffusion flame reactor to react alkali metal vapor and metal halide vapor to deposit metal, alloy and ceramic films. The reaction chemical is described by the following general equation: (mn)Na + nMXm → (M)n + (nm)NaX where Na is Na, or another alkali metal (e.g., K, Rb, Cs), and MXm is a metal-halide (M is a metal or other element such as Si, B or C; X is a halogen atom, e.g., Cl, F or the like; and m and n are integers). This reaction chemical is a viable technique for thin film growth. In one mode, using the precursors of Na metal vapor, TiCl4 (the limiting reagent), and either Ar or N gases, Ti, TiN, TiO2, and Ti silicide (TiSi, Ti5Si3, TiSi2, Ti5Si4) thin films can be grown on **Cu** and Si substrates. Conditions can be adjusted to prevent or minimize gas-phase particle nucleation and growth. Substrate temps. can also be varied to prevent excessive salt deposition.

IC ICM C23C016-06
ICS C23C016-22; C23C016-30

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56, **76**

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 13 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1997:669493 HCAPLUS

DOCUMENT NUMBER: 127:339773

TITLE: Thermal stability of PECVD W-B-N thin film as a diffusion barrier

AUTHOR(S): Kim, Yong Tae; Kim, Dong Joon; Lee, Chang Woo; Park, Jong-Wan

CORPORATE SOURCE: Semiconductor Materials Laboratory, Korea Institute of Science and Technology, Seoul, 136-791, S. Korea

SOURCE: Proceedings of SPIE-The International Society for Optical Engineering (**1997**), 3214(Multilevel Interconnect Technology), 48-56
CODEN: PSISDG; ISSN: 0277-786X

PUBLISHER: SPIE-The International Society for Optical Engineering

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Effects of B and N on elec. and metallurgical properties of plasma enhanced **chemical vapor deposited** W-B-N thin film were studied. These impurities keep the W-B-N thin film in a **nanostructured** amorphous phase and provide a stuffing effect that is very effective for preventing the fast diffusion of **Cu** atoms during a high temperature annealing process. The resistivity of the amorphous W-N and W-B-N thin films is attainable between 140 and 153 μΩ-cm by controlling a B10H14/NH3 flow ratio. The W-N and W-B-N barriers do not react with Si during an annealing in Ar ambient at 800-900° for 30 min and prevent interdiffusion of the **Cu** atom at 800-850° for 30 min, which is the best result regarding to the thermal stability of the diffusion barrier. An electromigration test for a SiO2/W-N/Al interconnect reveals that a medium time to failure is 2 times that of SiO2/TiN/Al schemes.

IT **7440-50-8**, **Copper**, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical

or engineered material use); PROC (Process); USES (Uses)
(properties and thermal stability of **PECVD** tungsten
boron nitride thin film as diffusion barrier)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC **76-2** (Electric Phenomena)
IT 7440-21-3, Silicon, processes **7440-50-8**, **Copper**,
processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical
or engineered material use); PROC (Process); USES (Uses)
(properties and thermal stability of **PECVD** tungsten
boron nitride thin film as diffusion barrier)
REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

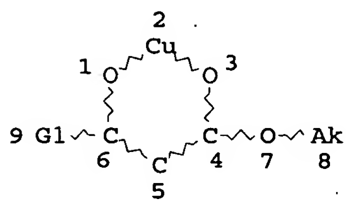
L38 ANSWER 14 OF 14 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1997:179615 HCAPLUS
DOCUMENT NUMBER: 126:270687
TITLE: Large deviation from Matthiessen's rule in **chemical vapor deposited copper** films and its correlation with **nanostructure**
AUTHOR(S): Ramaswamy, Geetha; Raychaudhuri, A. K.; Goswami, Jaydeb; Shivashankar, S. A.
CORPORATE SOURCE: Dep. Phys., Indian Inst. Sci., Bangalore, 560 012, India
SOURCE: Journal of Physics D: Applied Physics (**1997**), 30(5), L5-L9
CODEN: JPAPBE; ISSN: 0022-3727
PUBLISHER: Institute of Physics Publishing
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The resistivity (ρ) of **Cu** films grown by varying the pressure, and hence the growth rate, in metalorg. **CVD** was studied in the temperature range 4.2 K-300 K. The films exhibit a fairly high ρ(300 K) of 8-20 μΩ cm. Anal. of the temperature variation of ρ shows that the high ρ values are not just caused by elastic scattering from the impurities but the temperature dependence of ρ is also very high, resulting in a large deviation from Matthiessen's rule (DMR) in these films. This strong dependence on temperature and DMR was explained in a semi-quant. manner as arising from grain boundary and surface scattering. This is corroborated by STM studies on the films which show that films having a smooth surface and well connected grains have a lower ρ as opposed to films with poor connectivity.
IT **7440-50-8**, **Copper**, properties
RL: PRP (Properties)
(large deviation from Matthiessen's rule in **CVD**-grown
copper films and correlation with **nanostructure**
)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC **76-1** (Electric Phenomena)
ST deviation Matthiessen rule resistivity **CVD copper**
; **nanostructure copper** deviation Matthiessen
rule
IT Electric resistance
(Matthiessen's law; large deviation from Matthiessen's rule in
CVD-grown **copper** films and correlation with
nanostructure)
IT Electric resistance
Microstructure
(large deviation from Matthiessen's rule in **CVD**-grown
copper films and correlation with **nanostructure**
)
IT **7440-50-8**, **Copper**, properties
RL: PRP (Properties)
(large deviation from Matthiessen's rule in **CVD**-grown
copper films and correlation with **nanostructure**
)

=>

```
=> d l37 que stat
L7        123651 SEA FILE=HCAPLUS CVD OR (CHEMICAL? OR CHEM)(2A)(VAPOR?
                 OR VAPOUR?)(2A)DEPOSIT? OR OMCVD OR MOCVD OR LPCVD OR
                 PECVD OR HFCVD OR ULPCVD OR PACVD OR PCVD
L12              STR
```



Ak @10

```
VAR G1=10/SI/O
NODE ATTRIBUTES:
DEFAULT MLEVEL IS ATOM
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:
RING(S) ARE ISOLATED OR EMBEDDED
NUMBER OF NODES IS  10

STEREO ATTRIBUTES: NONE
L14          326 SEA FILE=REGISTRY SSS FUL L12
L15           11 SEA FILE=REGISTRY L14 AND P/ELS
L16            7 SEA FILE=HCAPLUS L15
L17            3 SEA FILE=HCAPLUS L16 AND L7
L26          464 SEA FILE=REGISTRY CUOC3O/ES
L27        10260 SEA FILE=REGISTRY CUOC3O/ESS
L28           67 SEA FILE=REGISTRY L26 AND P/ELS
L29          296 SEA FILE=REGISTRY L27 AND P/ELS
L32           67 SEA FILE=HCAPLUS L28
L33          164 SEA FILE=HCAPLUS L29
L34           28 SEA FILE=HCAPLUS (L32 OR L33) AND L7
L36           25 SEA FILE=HCAPLUS L34 NOT L17
L37           24 SEA FILE=HCAPLUS L36 AND (1804-2003)/PY,PRY

=> d l37 ibib abs hitstr hitind 1-24

L37  ANSWER 1 OF 24  HCAPLUS  COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER:         2005:348939  HCAPLUS
DOCUMENT NUMBER:          142:421524
TITLE:                    Heterogeneous activation layers formed by ionic
                          and electroless reactions used for IC
                          interconnect capping layers
INVENTOR(S):              Lopatin, Sergey D.; Shanmugasundram, Arulkumar;
                          Shacham-diamand, Yosef; Weidman, Timothy;
                          Lubomirsky, Dmitry
PATENT ASSIGNEE(S):       Applied Materials, Inc., USA
SOURCE:                   U.S. Pat. Appl. Publ., 19 pp.
                          CODEN: USXXCO
DOCUMENT TYPE:            Patent
LANGUAGE:                 English
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:

     PATENT NO.           KIND   DATE        APPLICATION NO.       DATE
     ---------------      ----   --------    --------------------
```

US 2005085031 A1 20050421 US 2004-967099 20041015 <--

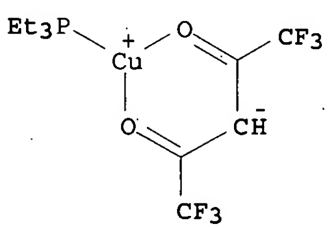
PRIORITY APPLN. INFO.: US 2003-511993P P 20031015 <--

AB There is a need for a method and composition to form an electroless layer, such as a capping layer with strong adhesion to a conductive layer, low elec. resistance and strong barrier properties. Embodiments of the invention generally provide compns. of activation-alloy solns., methods to deposit activation-alloys and electronic devices including activation-alloys and capping layers. In one embodiment, a method for depositing a capping layer for a semiconductor device is provided which includes exposing a conductive layer on a substrate surface to an activation-alloy solution, forming an activation-alloy layer on the conductive layer using the activation-alloy solution, and depositing the capping layer on the activation-alloy layer using an electroless deposition solution

IT **152219-08-4**
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(heterogeneous alloy activation layers formed by ionic and electroless reactions used for IC interconnect capping layers)

RN 152219-08-4 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(triethylphosphine)- (9CI) (CA INDEX NAME)



IC ICM H01L021-8238

INCL 438222000

CC 76-2 (Electric Phenomena)
Section cross-reference(s): 48, 56

IT **Vapor deposition** process
(**chemical**, atomic-layer **deposition**; heterogeneous alloy activation layers formed by ionic and electroless reactions used for IC interconnect capping layers)

IT 60-00-4, EDTA, processes 71-48-7, Cobalt acetate 71-50-1, Acetate, processes 77-92-9, Citric acid, processes 87-69-4, Tartaric acid, processes 97-94-9, Triethylborane 107-15-3, Ethylenediamine, processes 126-44-3, Citrate, processes 142-71-2, Copper acetate 298-12-4, Glyoxylic acid 302-01-2, Hydrazine, processes 992-94-9, Methylsilane 1111-74-6, Dimethylsilane 1333-74-0, Hydrogen, processes 1336-21-6, Ammonium hydroxide ((NH4)(OH)) 1344-67-8, Copper chloride 1590-87-0, Disilane 2814-79-1, Ethylsilane 3375-31-3, Palladium diacetate 4109-96-0, Dichlorosilane 6303-21-5, Hypophosphorous

acid 7646-79-9, Cobalt chloride ($CoCl_2$), processes 7647-01-0, Hydrochloric acid, processes 7647-10-1, Palladium chloride 7664-39-3, Hydrofluoric acid, processes 7664-41-7, Ammonia, processes 7664-93-9, Sulfuric acid, processes 7681-65-4, Copper iodide (CuI) 7758-89-6, Copper chloride (CuCl) 7758-98-7, Copper sulfate ($CuSO_4$), processes 7782-44-7, Oxygen, processes 7783-03-1, Tungstic acid 7783-26-8, Trisilane 7783-29-1, Tetrasilane 7787-70-4, Copper bromide (CuBr) 7790-75-2, Calcium tungstate 7803-62-5, Silane, processes 10024-97-2, Nitrous oxide, processes 10102-43-9, Nitric oxide, processes 10102-44-0, Nitrogen dioxide, processes 10124-43-3, Cobalt sulfate ($CoSO_4$) 12261-30-2 13283-31-3, Borane, processes 13394-86-0, DMAB 13395-16-9 13465-77-5, Hexachlorodisilane 13566-03-5, Palladium sulfate 14024-48-7 14024-61-4, Palladium acetylacetonate 14040-05-2 14220-26-9, Copper acetylacetonate 14781-45-4 15214-66-1 15855-70-6 19287-45-7, Diborane 19624-22-7, Pentaborane 32992-96-4 33292-37-4 36350-66-0, Triborane(9) 51811-79-1, RE 610 53199-31-8 60349-62-4, Tetraborane(12) 64916-48-9 85908-78-7 86233-74-1 137007-13-7 139566-53-3 **152219-08-4** 220409-27-8 308847-89-4 666854-30-4 850252-13-0 850252-14-1 850252-15-2
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(heterogeneous alloy activation layers formed by ionic and electroless reactions used for IC interconnect capping layers)

L37 ANSWER 2 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2003:984244 HCAPLUS
DOCUMENT NUMBER: 140:349537
TITLE: Mono- and bimetallic copper(I)- and silver(I)-phosphine complexes with β-diketonate units
AUTHOR(S): Lang, H.; Leschke, M.; Melter, M.; Walfort, B.; Koehler, K.; Schulz, S. E.; Gessner, T.
CORPORATE SOURCE: Fakultaet fuer Naturwissenschaften, Institut fuer Chemie, Lehrstuhl Anorganische Chemie, Technische Universitaet Chemnitz, Chemnitz, Germany
SOURCE: Zeitschrift fuer Anorganische und Allgemeine Chemie (**2003**), 629(12-13), 2371-2380
CODEN: ZAACAB; ISSN: 0044-2313
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal
LANGUAGE: German
OTHER SOURCE(S): CASREACT 140:349537

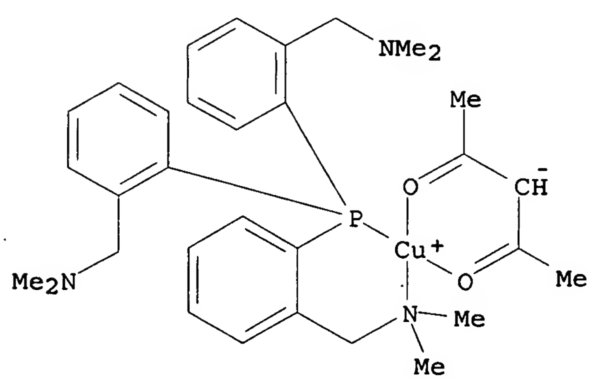
AB The reaction of [(η2-Me3SiC.tplbond.CSiMe3)CuBr]2 (1) with 2 equivalent of [M(O-O)] [M = Na, Ag; O-O = acac, 2a/3a; 1,1,1,5,5,5-hexafluoroacetylacetonate (hfac), 2b/3b; = 2,2,6,6-tetramethyl-3,5-heptanedionate (tehe), 2c/3c; 1,3-diphenyl-1,3-propandonate (dipa), 2d/3d; 2-methyl-4-pyronate (mepy), 2e/3e; troponolate (trop), 2f/3f] affords [(η2-Me3SiC.tplbond.CSiMe3)Cu(O-O)] (4a, acac; 4b, hfac; 4c, tehe; 4d, dipa; 4e, mepy; 4f, trop), which further reacts with PR3 (R = C6H4CH2NMe2-2)3 (5) to give the phosphane Cu(I) β-diketonato complexes [(R3P)Cu(O.intrsec.O)](O-O = acac, 6a; hfac, 6b; tehe, 6c; dipa, 6d; mepy, 6e; trop, 6f) via replacement of Me3SiC.tplbond.CSiMe3. Complexes 6a-6f are also formed, when 5 is reacted with equimolare amts. of CuCl (7) and than with Na(O-O) (2). Using the Ag salt Ag2(O2-O2) (O2-O2 = 1,4-benzochinoate (benz), 9a;

= 1,4-anthrachinoate (anth), 9b) instead of 2 or 3, than homobimetallic complexes of type [(R3P)Cu(O2-O2)Cu(PR3)] (O2-O2 = benz, 10a; anth, 10b) are accessible in which two copper(I) phosphine building blocks are spanned by the π-conjugated organic bridging unit O2-O2. The reaction of 3 with 5 in the ratio of 1:1 produces the phosphine-stabilized Ag(I) complexes [(R3P)Ag(O-O)] (O-O = acac, 11a; mepy , 11b; trop, 11c). Homobimetallic [(R3P) Ag(O2-O2)Ag2(PR3)] (O2-O2 = benz, 12a; anth, 12b), which is isostructural to 10, is accessible by treatment of 5 with 0.5 equiv of Ag2(O2-O2) (9). While the resp. Cu(I) complexes 6 and 10 are stable in solution and in the solid-state, it appeared that the appropriate Ag(I) complexes 11 and 12 decompose upon precipitation of Ag on their exposure to light. The application of 4a and 6c as precursors in the **CVD** process for the deposition of Cu films on TiN-coated SiO2 wafers is discussed. The solid-state structure of 6f is reported. Mononuclear 6f crystallizes together with [(R3P)CuCl] (8) (ratio 6f:8 = 85:15) in the triclinic space group P.hivin.1 with the cell parameters a = 8.962(2), b = 10.753(3), c = 17.037(5) Å, α = 78.29(2), β = 77.12(2), γ = 81.220(10), V = 1557.3(7) Å3, Z = 2 with 4703 observed unique reflections (R1 = 0.0661). The Cu(I) ion in 6f possesses the coordination number 4. A boat-like conformation for the 6-membered CuPNCH2C2/Phenyl cycle is found and the troponolate ligand is sym. chelate-bound via both O atoms to the Cu(I) ion.

IT **680602-12-4P 680602-13-5P 680602-14-6P**
680602-15-7P 680602-19-1P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

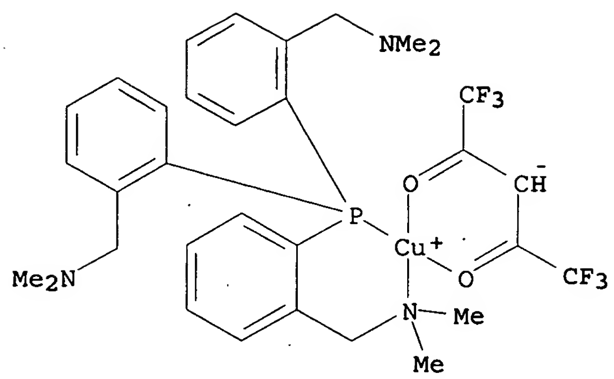
RN 680602-12-4 HCAPLUS

CN Copper, [2-[bis[2-[(dimethylamino)methyl]phenyl]phosphino-κP]-N,N-dimethylbenzenemethanamine-κN](2,4-pentanedionato-κO,κO')-, (T-4)- (9CI) (CA INDEX NAME)

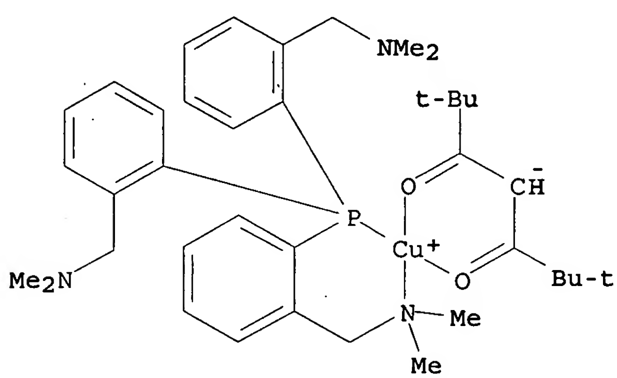


RN 680602-13-5 HCAPLUS

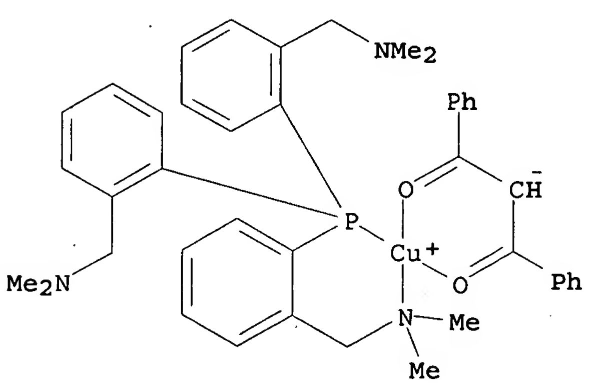
CN Copper, [2-[bis[2-[(dimethylamino)methyl]phenyl]phosphino-κP]-N,N-dimethylbenzenemethanamine-κN](1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')-, (T-4)- (9CI) (CA INDEX NAME)



RN 680602-14-6 HCAPLUS
CN Copper, [2-[bis[2-[(dimethylamino)methyl]phenyl]phosphino-κP]-N,N-dimethylbenzenemethanamine-κN](2,2,6,6-tetramethyl-3,5-heptanedionato-κO,κO')-, (T-4)- (9CI) (CA INDEX NAME)



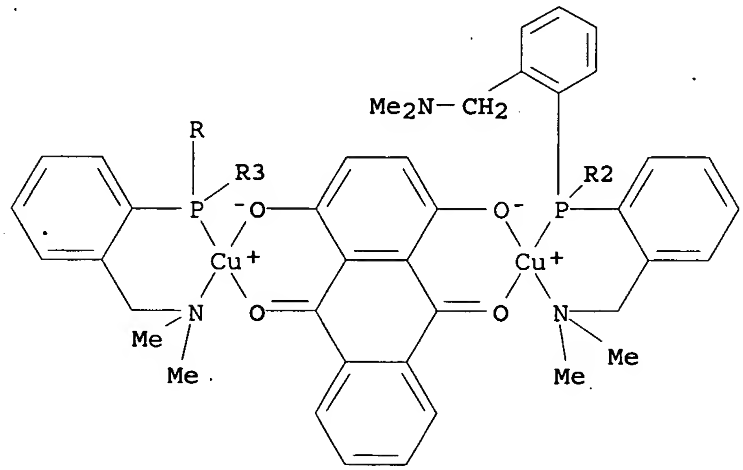
RN 680602-15-7 HCAPLUS
CN Copper, [2-[bis[2-[(dimethylamino)methyl]phenyl]phosphino-κP]-N,N-dimethylbenzenemethanamine-κN](1,3-diphenyl-1,3-propanedionato-κO,κO')-, (T-4)- (9CI) (CA INDEX NAME)



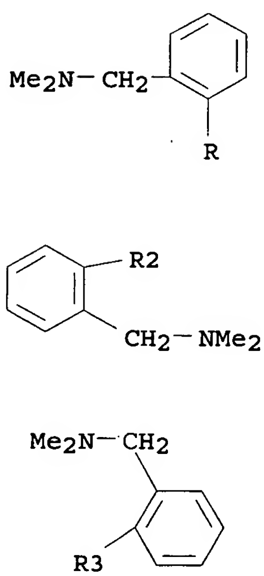
RN 680602-19-1 HCAPLUS
CN Copper, bis[2-[bis[2-[(dimethylamino)methyl]phenyl]phosphino-

κP]-N,N-dimethylbenzenemethanamine-κN][μ-[1,4-di(hydroxy-κO)-9,10-anthracenedionato(2-)-κO:κO']]di- (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 2-A



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 29, 75

IT 680602-10-2P 680602-11-3P **680602-12-4P** **680602-13-5P** **680602-14-6P** **680602-15-7P** 680602-16-8P 680602-17-9P 680602-18-0P **680602-19-1P** 680602-20-4P 680602-21-5P 680602-22-6P 680602-23-7P 680602-24-8P
RL: SPN (Synthetic preparation); PREP (Preparation)

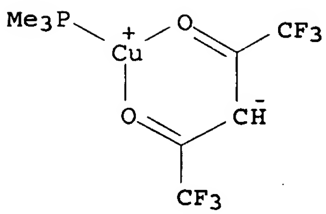
(preparation of)
REFERENCE COUNT: 77 THERE ARE 77 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 3 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:468872 HCAPLUS
DOCUMENT NUMBER: 139:236024
TITLE: Dissociation reactions of CuI(hfac)L compounds relevant to the **chemical vapor deposition** of copper
AUTHOR(S): Cavallotti, Carlo; Gupta, Vijay; Sieber, Cornelia; Jensen, Klavs F.
CORPORATE SOURCE: Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 02139, USA
SOURCE: Physical Chemistry Chemical Physics (**2003**), 5(13), 2818-2827
CODEN: PPCPFQ; ISSN: 1463-9076
PUBLISHER: Royal Society of Chemistry
DOCUMENT TYPE: Journal
LANGUAGE: English

AB D. functional theory (DFT) calcns. have been performed for ligand copper bond energies of typical copper β-diketonate compds. used in **chemical vapor deposition** (**CVD**) of copper films. The mols. have the general formula CuI(hfac)L, where hfac is hexafluoroacetylacetonate, and L represents vinyltrimethylsilane (VTMS), trimethylphosphine (PMe3), 2-butyne (2-butyne), or 1,5-cyclooctadiene (COD). The DFT method is used with the three-parameter Becke exchange and the Lee-Yang-Parr correlation functionals (B3LYP) with different basis sets. The optimized structures correspond to the crystal structures determined using crystal X-ray diffraction. Two different structures, CuI(hfac)(η2-COD) and CuI(hfac)(η4-COD), are determined for the CuI(hfac)(COD) complex, the latter being more stable by .apprx.3 kcal mol-1. The strength of the ligand-copper interaction is studied for the reaction CuI(β-diketonate)L CuI(β-diketonate) + L. Bond energies of 32.1, 35.6, 33.6 and 38.4 kcal mol-1 are calculated for typical Cu **CVD** precursors, CuI(hfac)(butyne), CuI(hfac)(COD), CuI(hfac)(VTMS) and CuI(hfac)(PMe3), resp. The similarity between these bond energies and reported exptl. activation energies for **CVD** suggests that the dissociation of the ligand L could be the rate determining step for the film growth under certain conditions. The rate parameters for the dissociation reaction of CuI(hfac)(VTMS) are evaluated based upon the results of the DFT calcns. A simple reaction mechanism for Cu **CVD** is proposed and combined with transport phenomena simulations of two reported reactors configurations. Good agreement with exptl. observations is obtained with a CuI(hfac)(VTMS) dissociation rate constant of 1.5 + 1014exp(-13.5/T), which is consistent with the computed rate constant

IT **135707-05-0**
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)

RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 67-3 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 29, 65, 75, 78
ST dissocn hexafluoroacetylacetonate complex **CVD** copper; **chem vapor deposition** copper dissocn hexafluoroacetylacetonate complex
IT Density functional theory
(B3LYP; dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)
IT **Vapor deposition** process
(**chemical**; dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)
IT Bond energy
Dissociation
Dissociation kinetics
Entropy
Reaction mechanism
Simulation and Modeling
Transport properties
Vibrational frequency
Zero point energy
(dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)
IT 86233-74-1 **135707-05-0** 137007-13-7 139566-53-3 244105-38-2
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)
IT 7440-50-8P, Copper, properties
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(dissociation reactions of CuI(hfac)L compds. relevant to the **chemical vapor deposition** of copper)
REFERENCE COUNT: 48 THERE ARE 48 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 4 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:133287 HCAPLUS
DOCUMENT NUMBER: 138:179780
TITLE: Preparation of metal aryl-β-diketonate complexes as precursors for metalorganic **chemical vapor deposition** to give metal oxides

INVENTOR(S): Anthony, Copeland Jones
PATENT ASSIGNEE(S): Inorgtech Limited, UK
SOURCE: PCT Int. Appl., 31 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003014134	A1	20030220	WO 2002-GB3657	20020807 <--

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: GB 2001-19224 A 20010807 <--

OTHER SOURCE(S): MARPAT 138:179780

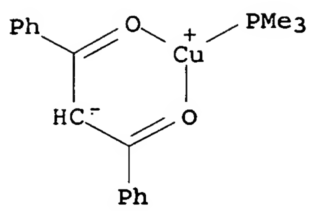
AB Claimed are metal compds. having at least one β-diketonate ligand containing an aryl group or a substituted derivative and their use in **CVD** techniques. A method of making said complexes comprises reacting a metal salt or compound with the β-diketone or its salt. A method for depositing metal oxides by **MOCVD** technique using these metal compound precursors is claimed, and a variety of metal oxides which may be prepared are claimed, including Pb(Sc0.5,Ta0.5)O3 (PST), Pb(Zr,Ti)O3, LaMnO3, LaNiO3, TiO2, (Ba,Sr)TiO3 (BST), Pb(Zr,Ti)O3 (PZT), layers of copper oxide or indium oxide with/without tin, SrBi2Ta2O9, Ta2O5, PbMg0.33Nb0.33O3, SrBi2(TaxNb1-x)2O9, niobium oxide, or ZrO2. Various precursors claimed include Ta(OEt)4(dbm) (dbm = dibenzoylmethanate), Ti(OPri)2(dbm)2, Pb(dbm)2 or Pb(dbm)2(L') (L' = unidentate or multidentate donor ligand), La(dbm)3(L'), Ni(dbm)2, Me2In(dbm), Cu(dbm)2, Nb(OEt)4(dbm), Cu(bzac)(L) and Cu(bzac)(L)2 (bzac = benzoylacetonate, L = trialkyl phosphite or trialkylphosphine), etc. The preparation of Ta(OEt)4(dbm), Nb(OEt)4(dbm), Pb(dbm)2, and Ti(OPri)2(dbm)2 are described, as are the deposition of Ta2O5 from Ta(OEt)4(dbm) and niobium oxide from Nb(OEt)4(dbm).

IT **138312-69-3P 497229-16-0P 497229-19-3P 497229-21-7P 497229-22-8P 497229-25-1P 497229-27-3P 497229-29-5P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

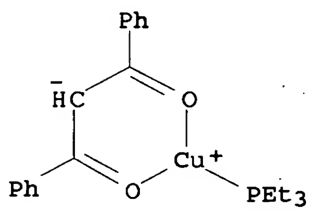
RN 138312-69-3 HCAPLUS

CN Copper, (1,3-diphenyl-1,3-propanedionato-O,O')(trimethylphosphine)-

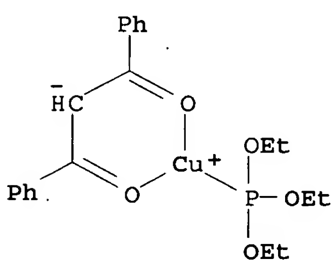
(9CI) (CA INDEX NAME)



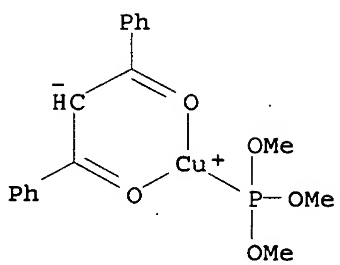
RN 497229-16-0 HCAPLUS
CN Copper, (1,3-diphenyl-1,3-propanedionato-κO,κO')(triethylphosphine)- (9CI) (CA INDEX NAME)



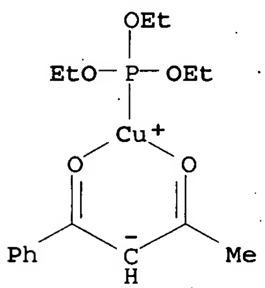
RN 497229-19-3 HCAPLUS
CN Copper, (1,3-diphenyl-1,3-propanedionato-κO,κO')(triethyl phosphite-κP)- (9CI) (CA INDEX NAME)



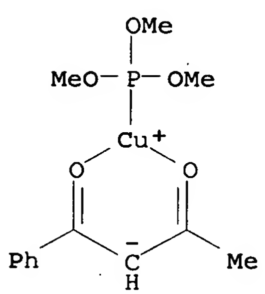
RN 497229-21-7 HCAPLUS
CN Copper, (1,3-diphenyl-1,3-propanedionato-κO,κO')(trimethyl phosphite-κP)- (9CI) (CA INDEX NAME)



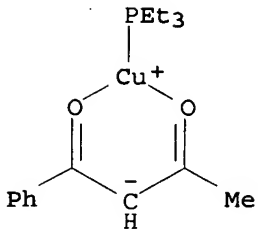
RN 497229-22-8 HCAPLUS
CN Copper, (1-phenyl-1,3-butanedionato-κO,κO')(triethyl phosphite-κP)- (9CI) (CA INDEX NAME)



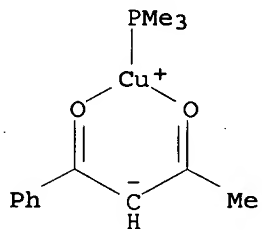
RN 497229-25-1 HCAPLUS
CN Copper, (1-phenyl-1,3-butanedionato-κO,κO')(trimethyl phosphite-κP)- (9CI) (CA INDEX NAME)



RN 497229-27-3 HCAPLUS
CN Copper, (1-phenyl-1,3-butanedionato-κO,κO')(triethylphosphine)- (9CI) (CA INDEX NAME)



RN 497229-29-5 HCAPLUS
CN Copper, (1-phenyl-1,3-butanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



IC ICM C07F019-00
ICS C07F007-00; C07F009-00; C23C016-00
CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 29, 57
ST metal diketonate aryl substituted prepn **MOCVD** precursor; oxide metal prepn aryldiketonate **MOCVD** precursor
IT Ketones, preparation
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(1,3-diketones, metal complexes; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)
IT Transition metal complexes
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(diketone; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)
IT Ketones, preparation
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(diketones, transition metal complexes; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)
IT Vapor deposition process
(metalorg.; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)
IT Oxides (inorganic), preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)
IT 7440-31-5P, Tin, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)

(films layered with metal oxides; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 7440-50-8P, Copper, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(films; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 120-46-7, Dibenzoylmethane 546-68-9, Titanium(IV) isopropoxide 3236-82-6, Niobium(V) ethoxide 6074-84-6, Tantalum(V) ethoxide
RL: RCT (Reactant); RACT (Reactant or reagent)
(for preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 1312-43-2P, Indium oxide 1344-70-3P, Copper oxide
RL: SPN (Synthetic preparation); PREP (Preparation)
(layered films alone or with tin; preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 93-91-4DP, Benzoylacetone, metal complexes 120-46-7DP, Dibenzoylmethane, metal complexes
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors)

IT 7439-91-0D, Lanthanum, dibenzoylmethanate complexes
RL: RCT (Reactant); RACT (Reactant or reagent)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 121-45-9DP, Trimethyl phosphite, metal aryl-β-diketonate complexes 122-52-1DP, Triethyl phosphite, metal aryl-β-diketonate complexes 554-70-1DP, Triethylphosphine, metal aryl-β-diketonate complexes 594-09-2DP, Trimethylphosphine, metal aryl-β-diketonate complexes 7440-50-8DP, Copper, aryl-β-diketonate complexes 12103-39-8P 14405-47-1P 16904-43-1P 16904-44-2P 17455-33-3P 58179-06-9P **138312-69-3P** 497229-06-8DP, complexes with unidentate or multidentate donor ligands 497229-06-8P 497229-08-0P 497229-10-4P 497229-12-6P 497229-14-8P **497229-16-0P** **497229-19-3P** **497229-21-7P** **497229-22-8P** **497229-25-1P** **497229-27-3P** **497229-29-5P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

IT 1313-96-8P, Niobium oxide 1314-23-4P, Zirconium oxide (ZrO_2), preparation 1314-61-0P, Tantalum oxide (Ta_2O_5) 12031-12-8P, Lanthanum manganese oxide ($LaMnO_3$) 12031-18-4P, Lanthanum nickel oxide ($LaNiO_3$) 12036-91-8P, Lead scandium tantalum oxide ($PbSc_{0.5}Ta_{0.5}O_3$) 12626-81-2P, Lead titanium zirconium oxide ($PbTiZrO_3$) 13463-67-7P, Titanium dioxide, preparation 37303-24-5P, Barium strontium titanium oxide ($BaSrTiO_3$) 50811-07-9P, Bismuth strontium tantalum oxide ($Bi_2SrTa_2O_9$) 136628-89-2P, Lead magnesium niobium oxide ($PbMg_{0.33}Nb_{0.33}O_3$) 156832-05-2P, Bismuth niobium strontium tantalum oxide ($Bi_2Nb_{0-2}SrTa_{0-2}O_9$)
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of metal aryl-β-diketonate complexes as **MOCVD** precursors of metal oxides)

REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 5 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:788882 HCAPLUS
DOCUMENT NUMBER: 137:302578
TITLE: Copper atomic layer **chemical vapor deposition**
INVENTOR(S): Powell, Ronald A.; Fair, James A.
PATENT ASSIGNEE(S): Novellus Systems, Inc., USA
SOURCE: U.S., 10 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

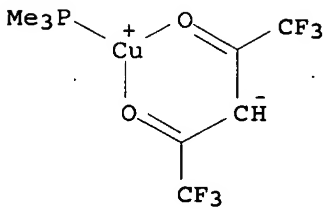
PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
US 6464779	B1	20021015	US 2001-766143 <--		20010119
US 6849122	B1	20050201	US 2002-94308 <--		20020307
US 7014709	B1	20060321	US 2004-838443 <--		20040503
PRIORITY APPLN. INFO.:			US 2001-766143 <--	A2	20010119
			US 2002-94308 <--	A1	20020307

AB This invention pertains to systems and methods for atomic layer **CVD**. More specifically, the invention pertains to methods for Cu atomic layer **CVD**, particularly to deposit a seed layer prior to the electrochem. Cu fill operation in integrated circuit fabrication. It also pertains to apparatus modules for performing such deposition.

IT **135707-05-0**, (Hexafluoroacetylacetonato)(trimethylphosphine) copper
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(precursor; copper atomic layer **chemical vapor deposition**)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



```
IC    ICM  C30B029-02
INCL 117089000
CC    75-1 (Crystallography and Liquid Crystals)
      Section cross-reference(s): 76
ST    atomic layer chem vapor deposition
      copper
IT    Vapor deposition process
         (chemical, atomic layer deposition; copper atomic
         layer chemical vapor deposition)
IT    Copper alloy, base
      RL: FMU (Formation, unclassified); PEP (Physical, engineering or
      chemical process); PYP (Physical process); TEM (Technical or
      engineered material use); FORM (Formation, nonpreparative); PROC
      (Process); USES (Uses)
         (atomic layer chemical vapor deposition
         of)
IT    7440-50-8, Copper, processes
      RL: FMU (Formation, unclassified); PEP (Physical, engineering or
      chemical process); PYP (Physical process); TEM (Technical or
      engineered material use); FORM (Formation, nonpreparative); PROC
      (Process); USES (Uses)
         (copper atomic layer chemical vapor
         deposition)
IT    14040-05-2, Bis(2,2,6,6-tetramethylheptane-3,5-dionato)copper
      86233-74-1, (1,5-Cyclooctadiene)(hexafluoroacetylacetonato)copper
      135707-05-0, (Hexafluoroacetylacetonato)(trimethylphosphine)
      copper   137007-13-7   139566-53-3
      RL: CPS (Chemical process); PEP (Physical, engineering or chemical
      process); PROC (Process)
         (precursor; copper atomic layer chemical vapor
         deposition)
REFERENCE COUNT:         7      THERE ARE 7 CITED REFERENCES AVAILABLE FOR
                                THIS RECORD. ALL CITATIONS AVAILABLE IN
                                THE RE FORMAT

L37  ANSWER 6 OF 24  HCAPLUS  COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER:        2002:514621  HCAPLUS
DOCUMENT NUMBER:         137:56068
TITLE:                   CVD of copper thin film
INVENTOR(S):             Kusumoto, Toshiro; Murata, Masaaki; Ichihashi,
                         Motoko; Ozono, Shuji
PATENT ASSIGNEE(S):      Ulvc Japan, Ltd., Japan
SOURCE:                  Jpn. Kokai Tokkyo Koho, 6 pp.
                         CODEN: JKXXAF
DOCUMENT TYPE:           Patent
LANGUAGE:                Japanese
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
```

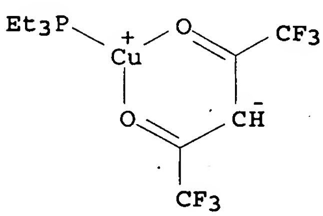
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002194545	A2	20020710	JP 2000-390346	20001222 <--
PRIORITY APPLN. INFO.:			JP 2000-390346	20001222 <--

AB A **CVD** method for depositing a copper thin film on a substrate involves supplying a β-diketone aliphatic ketone having only O as a dissimilar atom to promote **CVD** nucleation. Optionally, the underlayer for the deposition may comprise a PVD copper film, or Ta, W, Ti, Mo, Cr, Zr, V, Nb, Hf, or their nitrides. Specifically, the ketone may comprise.

IT **152219-08-4**
RL: NUU (Other use, unclassified); USES (Uses)
(**CVD** of copper thin film)

RN 152219-08-4 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(triethylphosphine)- (9CI) (CA INDEX NAME)



IC ICM C23C016-18
ICS C23C014-14; H01L021-285

CC 76-3 (Electric Phenomena)

ST **CVD** copper ketone

IT Nitrides
RL: NUU (Other use, unclassified); USES (Uses)
(**CVD** of copper thin film)

IT Ketones, uses
RL: NUU (Other use, unclassified); USES (Uses)
(aliphatic; **CVD** of copper thin film)

IT **Vapor deposition** process
(**chemical**; **CVD** of copper thin film)

IT 7440-50-8, Copper, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**CVD** of copper thin film)

IT 7439-98-7, Molybdenum, uses 7440-03-1, Niobium, uses 7440-25-7, Tantalum, uses 7440-32-6, Titanium, uses 7440-33-7, Tungsten, uses 7440-47-3, Chromium, uses 7440-58-6, Hafnium, uses 7440-62-2, Vanadium, uses 7440-67-7, Zirconium, uses 12261-30-2 14781-45-4, Bis(hexafluoroacetylacetonato) copper (II) 35342-67-7 53513-38-5 86233-74-1 137007-13-7 137039-38-4 139566-53-3 **152219-08-4**
RL: NUU (Other use, unclassified); USES (Uses)
(**CVD** of copper thin film)

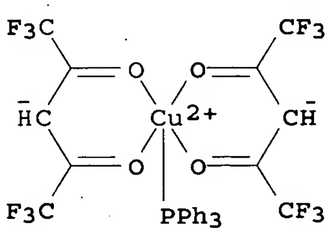
L37 ANSWER 7 OF 24 HCAPLUS

ACCESSION NUMBER: 2001:735706 HCAPLUS
DOCUMENT NUMBER: 136:47490
TITLE: Synthesis of β-diketonate complexes of Cu(II) and Cu(I) with hydrazine and triphenylphosphine as precursors for **CVD** synthesis of copper films
AUTHOR(S): Zub, V. Ya.; Berezhnitskaya, O. S.; Mazurenko, E. A.
CORPORATE SOURCE: Nats. Univ. im. Tarasa Shevchenko, Kiev, Russia
SOURCE: Ukrainskii Khimicheskii Zhurnal (Russian Edition) (**2001**), 67(7-8), 75-79
CODEN: UKZHAU; ISSN: 0041-6045
PUBLISHER: Institut Obshchei i Neorganicheskoi Khimii im. V. I. Vernadskogo NAN Ukrainy
DOCUMENT TYPE: Journal
LANGUAGE: Russian
OTHER SOURCE(S): CASREACT 136:47490

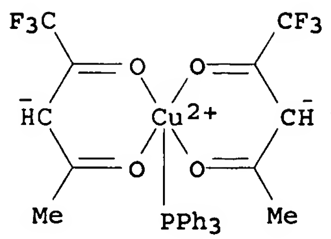
AB CuL2.L1 (HL = trifluoroacetylacetone, hexafluoroacetylacetone, decafluoroheptane-4,6-dione; L1 N2H4, PPh3) were prepared and characterized by EPR, electronic and IR spectroscopy and thermal analyses. The structure of complexes depends from nature of substituents in β-ketonate ligands. In the presence of excess PPh3 the Cu(II) complexes were reduced to Cu(I) complexes, but in the presence of N2H4 to metallic Cu. The Cu(II) and Cu(I) complexes sublime in vacuum without decomposition and may be used for gas-phase preparation of metal films.

IT **52049-89-5P 60542-70-3P 380367-04-4P**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation and ESR and thermal stability and reduction in presence of hydrazine/triphenylphosphine)

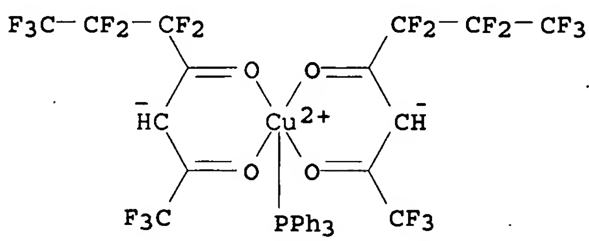
RN 52049-89-5 HCAPLUS
CN Copper, bis(1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')(triphenylphosphine)-, (SP-5-22)- (9CI) (CA INDEX NAME)



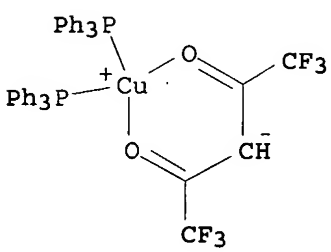
RN 60542-70-3 HCAPLUS
CN Copper, bis(1,1,1-trifluoro-2,4-pentanedionato-O,O')(triphenylphosphine)- (9CI) (CA INDEX NAME)



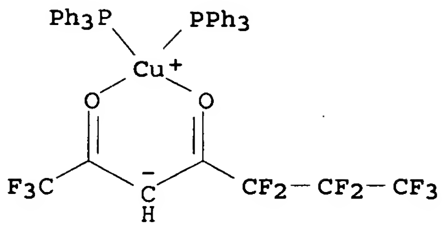
RN 380367-04-4 HCAPLUS
CN Copper, bis(1,1,1,5,5,6,6,7,7,7-decafluoro-2,4-heptanedionato-κO,κO')(triphenylphosphine)- (9CI) (CA INDEX NAME)



IT **37549-48-7P**, (Hexafluoroacetylacetonato)bis(triphenylphosphine)copper **380367-05-5P**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal stability)
RN 37549-48-7 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')bis(triphenylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



RN 380367-05-5 HCAPLUS
CN Copper, (1,1,1,5,5,6,6,7,7,7-decafluoro-2,4-heptanedionato-κO,κO')bis(triphenylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 77

IT **52049-89-5P 60542-70-3P 380367-04-4P**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparation and ESR and thermal stability and reduction in presence of hydrazine/triphenylphosphine)

IT **37549-48-7P**, (Hexafluoroacetylacetonato)bis(triphenylphosphine)copper **380367-05-5P**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal stability)

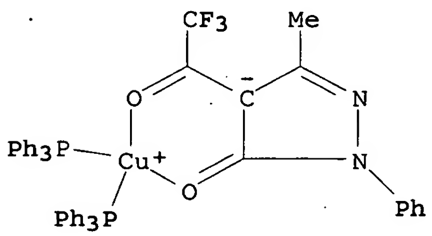
L37 ANSWER 8 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER:	2001:255445 HCAPLUS
DOCUMENT NUMBER:	135:101429
TITLE:	Structure and volatility of copper complexes containing pyrazolyl-based ligands
AUTHOR(S):	Pettinari, C.; Marchetti, F.; Santini, C.; Pettinari, R.; Drozdov, A.; Troyanov, S.; Battiston, G. A.; Gerbasi, R.
CORPORATE SOURCE:	Dipartimento di Scienze Chimiche, Universita degli Studi, Camerino, I-62032, Italy
SOURCE:	Inorganica Chimica Acta (**2001**), 315(1), 88-95 CODEN: ICHAA3; ISSN: 0020-1693
PUBLISHER:	Elsevier Science S.A.
DOCUMENT TYPE:	Journal
LANGUAGE:	English

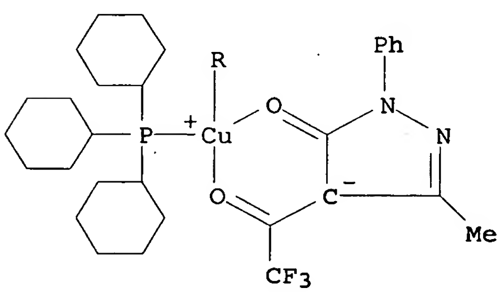
AB Volatility studies, electrospray mass spectra and IR in vapor phase were carried out for Cu(I) and Cu(II) complexes containing anionic pyrazole-based ligands such as 4-acyl-5-pyrazolonates and poly(pyrazolyl)borates. The volatility was related to structural features and mol. parameters of the copper complexes. The crystal structures of [Cu(Q')2(bipy)]·(acetone)1.5 (Q' = 1-phenyl-3-methyl-4-benzoylpyrazolon-5-ato, bipy = 2,2'-bipyridyl) and [Cu(QF)2(phen)]·EtOH (QF = 1-phenyl-3-methyl-4-trifluoroacetylpyrazolon-5-ato, phen = 1,10-phenanthroline), were also determined In these complexes the copper atom is in a tetragonally distorted octahedral arrangement of the four O-atoms of pyrazolones with N2-donor ligand in equatorial position. Two sets of Cu-O distances, the longer being in axial positions, were found. XRD data of films obtained from metal organic **CVD MOCVD** expts. on [Cu(poly(pyrazolyl)borate)(PR3)] also are reported.

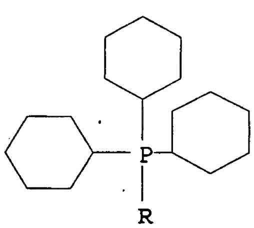
IT **181875-51-4P 262434-87-7P 262434-88-8P**
262434-89-9P
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and effect of structure on volatility)

RN 181875-51-4 HCAPLUS
CN Copper, [2,4-dihydro-5-methyl-2-phenyl-4-(trifluoroacetyl-κO)-3H-pyrazol-3-onato-κO3]bis(triphenylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)

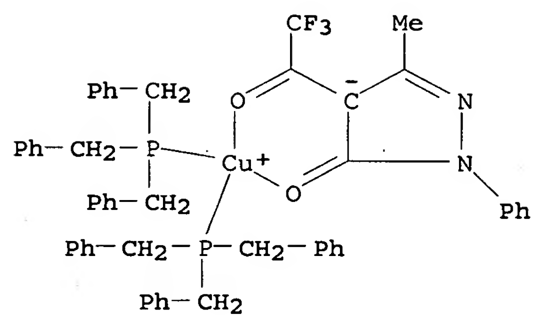


RN 262434-87-7 HCAPLUS
CN Copper, [2,4-dihydro-5-methyl-2-phenyl-4-(trifluoroacetyl-κO)-3H-pyrazol-3-onato-κO3]bis(tricyclohexylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



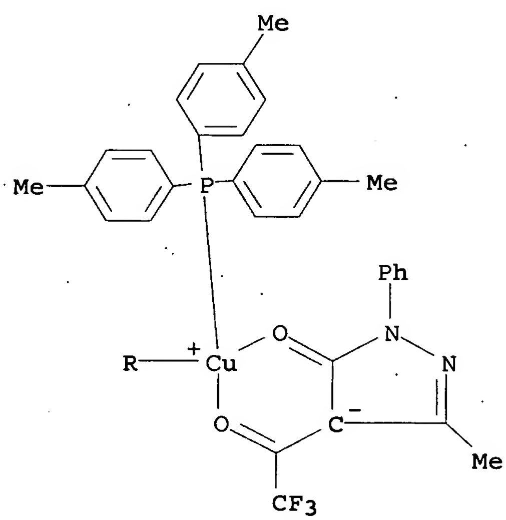


RN 262434-88-8 HCAPLUS
CN Copper, [2,4-dihydro-5-methyl-2-phenyl-4-(trifluoroacetyl-κO)-3H-pyrazol-3-onato-κO3]bis[tris(phenylmethyl)phosphine]-, (T-4)- (9CI) (CA INDEX NAME)

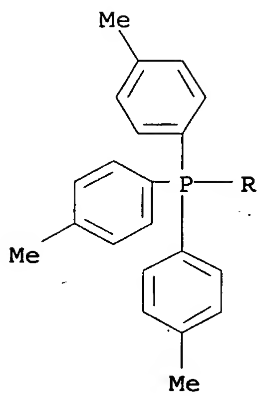


RN 262434-89-9 HCAPLUS
CN Copper, [2,4-dihydro-5-methyl-2-phenyl-4-(trifluoroacetyl-κO)-3H-pyrazol-3-onato-κO3]bis[tris(4-methylphenyl)phosphine]-, (T-4)- (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 2-A



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 66, 75
ST crystal structure copper benzoylpyrazolonato bipyridyl acetylpyrazolonato phenanthroline; copper acylpyrazolonate polypyrazolylborate prepn structure volatility; benzoylpyrazolonate copper bipyridyl prepn structure volatility; acetylpyrazolonate copper phenanthroline prepn structure volatility; pyrazolonate copper complex prepn structure volatility; borate pyrazolyl copper complex prepn volatility; **MOCVD** precursor copper polypyrazolylborate phosphine complex
IT 81714-07-0P 181875-45-6P **181875-51-4P** 185038-49-7P 185038-51-1P **262434-87-7P** **262434-88-8P** **262434-89-9P** 347915-90-6P
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and effect of structure on volatility)
IT 185038-48-6P
RL: PEP (Physical, engineering or chemical process); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(preparation, effect of structure on volatility and investigation as **MOCVD** precursor)
REFERENCE COUNT: 59 THERE ARE 59 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

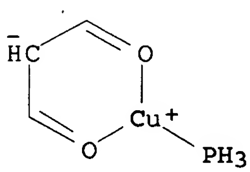
L37 ANSWER 9 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1999:440541 HCAPLUS
DOCUMENT NUMBER: 131:190222
TITLE: A density functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compounds
AUTHOR(S): Cavallotti, Carlo; Jensen, Klavs F.
CORPORATE SOURCE: Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 02139, USA
SOURCE: Proceedings - Electrochemical Society (**1999**), 98-23(Fundamental Gas-Phase and Surface Chemistry of Vapor-Phase Materials Synthesis), 10-15

CODEN: PESODO; ISSN: 0161-6374
PUBLISHER: Electrochemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English

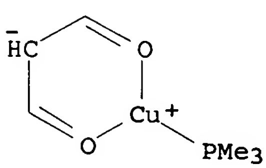
AB Systematic d. functional theory (DFT) calcns. have been performed for ligand copper bond energies of typical copper β-diketonate compds. used in **chemical vapor deposition** (**CVD**) of copper films. The mols. have the general formula (hfac)Cu1-L, where hfac is hexafluoroacetylacetonate, and L represents: vinyltrimethylsilane (VTMS), trimethyl-phosphine, 2-butyne, and 1,5-cyclooctadiene. The hybrid DFT method is used with the three-parameter Becke exchange and the Lee-Yang-Parr correlation functionals (i.e., B3LYP) with different levels of basis sets. Based on the result of the quantum chemical calcns., a gas phase and surface kinetic model for the **chemical vapor deposition** of copper from (hfac)Cu1-VTMS is formulated. Depending upon the deposition conditions the rate determining step is either the gas phase scission of the vinyltrimethylsilane ligand from the copper compound or the surface reaction between two adsorbed Cu(hfac) species. The predicted growth rates are in good agreement with exptl. observations.

IT **180724-71-4 240412-79-7**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)

RN 180724-71-4 HCAPLUS
CN Copper, (phosphine)(propanedialato-κO,κO')- (9CI) (CA INDEX NAME)



RN 240412-79-7 HCAPLUS
CN Copper, (propanedialato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 67-3 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 29, 65, 75

ST density functional theory **chem vapor deposition** copper; hexafluoroacetylacetonate copper complex **CVD** DFT; kinetics hexafluoroacetylacetonate copper complex **CVD** DFT

IT **Vapor deposition** process
(**chemical**; d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)
IT Density functional theory
Reaction kinetics
Surface reaction kinetics
Vibrational frequency
(d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)
IT Free energy
(dissociation; d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)
IT 86233-75-2 139566-53-3 **180724-71-4** 240412-78-6 **240412-79-7** 240412-80-0 240412-81-1 240412-82-2
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)
IT 7440-50-8P, Copper, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(d. functional theory study of **chemical vapor deposition** of copper from (hfac)CuL compds.)
REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 10 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1997:802293 HCAPLUS
DOCUMENT NUMBER: 128:82528
TITLE: **MOCVD** process for Cu-Ag alloy films and compositions therefor including trimethylsilyl groups
INVENTOR(S): Itsuki, Atsushi; Sato, Masamitsu; Ogi, Katsumi
PATENT ASSIGNEE(S): Mitsubishi Materials Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09324271	A2	19971216	JP 1996-145927	19960607

<--

PRIORITY APPLN. INFO.: JP 1996-145927 19960607

<--

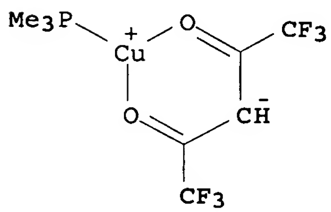
OTHER SOURCE(S): MARPAT 128:82528
AB Title process uses sources of (hfac)Cu(I)L1 and (hfac)Ag(I)L2 (L1-2 = Me3Si-substituted olefins or alkynes, organic phosphines; hfac = 1,1,1,5,5,5-hexafluoro-2,4-pentanedionato; n = 2-4; L1 and/or L2 is Me3Si-substituted ethene or propene; L1 $\neq$ L2). Title compns.

contain the sources and organic solvents. The as-manufactured alloy films show low resistance and good electromigration resistance, and are useful for contacts or wirings of semiconductor devices.

IT **135707-05-0**, Trimethylphosphine(1,1,1,5,5,5-Hexafluoro-2,4-pentanedionato)copper(I)
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



IC ICM C23C016-18
ICS H01L021-285; C07F001-08; C07F001-10

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56, 76, 78

ST copper silver alloy film **MOCVD** source; alkylmethylsilane fluoropentanatocopper fluoropentanatosilver source **MOCVD**; electromigration resistant copper silver alloy film; low resistance copper silver alloy film

IT Electric conductors
(**MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

IT Organometallic compounds
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**MOCVD** sources; **MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

IT Vapor deposition process
(metalorg.; **MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

IT 12614-76-5P 12614-78-7P 12630-16-9P 58541-76-7P 86612-68-2P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

IT **135707-05-0**, Trimethylphosphine(1,1,1,5,5,5-Hexafluoro-2,4-pentanedionato)copper(I) 139566-53-3, Trimethylsilylethene(1,1,1,5,5,5-hexafluoro-2,4-pentanedionato)copper(I) 148630-66-4, Trimethylphosphine(1,1,1,5,5,5-Hexafluoro-2,4-pentanedionato)silver(I) 164293-94-1 166036-13-1 172210-75-2, trans-1,2-Bis(trimethylsilyl)ethylene(1,1,1,5,5,5-Hexafluoro-2,4-pentanedionato)copper(I) 172261-43-7 173341-67-8 185949-15-9, Trimethylsilylethene(1,1,1,5,5,5-hexafluoro-2,4-pentanedionato)silver(I) 185949-17-1
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(**MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

IT 754-05-2, Trimethylsilylethylene 762-72-1 18178-59-1, trans-1,2-Bis(trimethylsilyl)ethylene 39881-79-3 164293-95-2
RL: TEM (Technical or engineered material use); USES (Uses)
(source solvents; **MOCVD** sources for Cu-Ag alloy films with low resistance and good electromigration resistance)

L37 ANSWER 11 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1995:227547 HCAPLUS
DOCUMENT NUMBER: 122:304254
TITLE: Selective and blanket **chemical vapor deposition** of copper from beta-diketonate/copper complexes by silica surface modification
INVENTOR(S): Hampden-Smith, Mark J.; Kodas, Toivo T.
PATENT ASSIGNEE(S): University of New Mexico, USA
SOURCE: U.S., 12 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5358743	A	19941025	US 1992-980087	19921124 <--

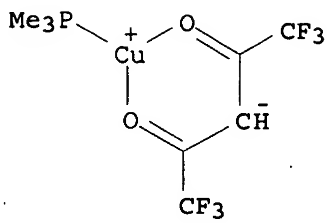
PRIORITY APPLN. INFO.: US 1992-980087 19921124 <--

AB Methods of selectively depositing copper onto exposed metallic substrates partially covered by a layer of silica entail: partially covering a metallic substrate with a layer of silica so that the metallic substrate is partially exposed; treating the silica with a functionalized organosilane to render the silica unreceptive to the deposition of copper thereon; and subjecting the treated silica and the exposed metallic substrate to a precursor material containing copper, whereby the copper is deposited only onto the exposed metallic substrate. Application to the formation of vertical interconnects in integrated circuits is indicated.

IT **135707-05-0**
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(selective and blanket **chemical vapor deposition** of copper from beta-diketonate/copper complexes by silica surface modification)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



```
IC    ICM  C23C014-04
INCL 427282000
CC    76-2 (Electric Phenomena)
      Section cross-reference(s): 75
ST    copper CVD diketonate complex precursor
IT    Vapor deposition processes
         (selective and blanket chemical vapor
         deposition of copper from beta-diketonate/copper
         complexes by silica surface modification)
IT    75-77-4, Trimethylchlorosilane, uses   75-78-5,
      Dimethyldichlorosilane
      RL: NUU (Other use, unclassified); USES (Uses)
         (selective and blanket chemical vapor
         deposition of copper from beta-diketonate/copper
         complexes by silica surface modification)
IT    7631-86-9, Silica, processes
      RL: NUU (Other use, unclassified); PEP (Physical, engineering or
      chemical process); PROC (Process); USES (Uses)
         (selective and blanket chemical vapor
         deposition of copper from beta-diketonate/copper
         complexes by silica surface modification)
IT    86233-74-1 135707-05-0  137007-13-7   139566-53-3,
      (1,1,1,5,5,5-Hexafluoroacetylacetonato)(vinyltrimethylsilane)copper
      RL: NUU (Other use, unclassified); PEP (Physical, engineering or
      chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or
      reagent); USES (Uses)
         (selective and blanket chemical vapor
         deposition of copper from beta-diketonate/copper
         complexes by silica surface modification)
IT    7440-50-8, Copper, processes
      RL: PEP (Physical, engineering or chemical process); PROC (Process)
         (selective and blanket chemical vapor
         deposition of copper from beta-diketonate/copper
         complexes by silica surface modification)
```

L37 ANSWER 12 OF 24 HCAPLUS

ACCESSION NUMBER: 1994:150126 HCAPLUS
DOCUMENT NUMBER: 120:150126
TITLE: Selective **chemical vapor deposition** of copper onto laser-patterned poly(tetrafluoroethylene), (PTFE) substrates
AUTHOR(S): Chi, Kai Ming; Corbitt, T. S.; Perry, W. L.; Hampden-Smith, M. J.; Kodas, T. T.; Rye, R. R.; Meunchausen, R.
CORPORATE SOURCE: Dep. Chem., Univ. New Nexico, Albuquerque, NM, 87131, USA
SOURCE: Adv. Met. ULSI Appl. 1992, Proc. Conf. (**1993**), Meeting Date 1992, 91-7.

Editor(s): Cale, Timothy S.; Pintchovski, Fabio S. Mater. Res. Soc.: Pittsburgh, Pa.
CODEN: 59LFAS

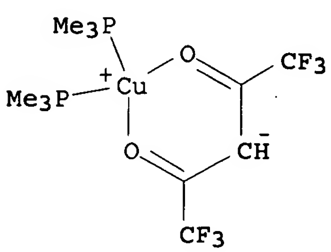
DOCUMENT TYPE: Conference
LANGUAGE: English

AB The formation of small copper features on Poly(tetrafluoroethylene), PTFE, substrates, has been achieved through chemical and irradiative (electron-beam, X-ray, Laser) surface modification followed by selective-area **chemical vapor deposition** of high-purity copper via thermally-induced disproportionation of (β-diketonate)CuL compds. In the case of electron beams and X-rays, PTFE is first irradiated then chemical etched to produce a patterned surface and copper films are selectively grown on the non-irradiated areas. Alternatively, the PTFE substrate can be completely chemical etched with sodium naphthalenide solution and subsequently patterned with either an argon ion or excimer laser. Copper **chemical vapor deposition**, **CVD**, using copper(I) precursors results in deposition only onto the non-irradiated area of the PTFE substrates. The chemical modification step serves two purposes. The chemical reaction of sodium naphthalenide results in formation of a reactive surface on which the metal-organic copper precursors can decompose In addition, the chemical modification results in formation of a porous, high-area surface which facilitates mech. bonding of the copper film to the PTFE surface resulting in good adhesion strength. Features with sizes in the range 20-50 μm have been prepared by these methods.

IT **138312-65-9**
RL: USES (Uses)
(**CVD** of copper from, onto laser-patterned PTFE substrates)

RN 138312-65-9 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')bis(trimethylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)

ST PTFE copper **CVD** integrated circuit; vapor deposition copper PTFE

IT Electric circuits
(integrated, **CVD** of copper onto laser-patterned PTFE substrates for)

IT Ablation
(laser-induced, patterning of PTFE substrates for copper **CVD** using, for integrated circuits fabrication)

IT 7440-50-8D, Copper, β-diketonates **138312-65-9**
RL: USES (Uses)
(**CVD** of copper from, onto laser-patterned PTFE substrates)

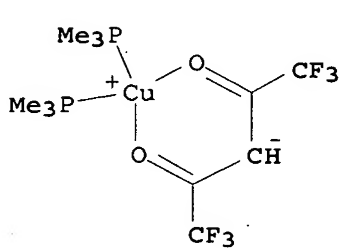
IT 9002-84-0, PTFE

RL: USES (Uses)
(**CVD** of copper onto laser-patterned substrates of)
IT 7440-50-8P, Copper, preparation
RL: PREP (Preparation)
(**CVD** of, from copper β-diketonates, onto laser-patterned polytetrafluoroethylene substrates)

L37 ANSWER 13 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1994:150125 HCAPLUS
DOCUMENT NUMBER: 120:150125
TITLE: Selective **CVD** of copper on tungsten versus silica from (β-diketonate)CuLn copper(I) precursors via silica surface modification
AUTHOR(S): Jain, Ajay; Farkas, J.; Chi, K. M.; Hampden-Smith, M. J.; Kodas, T. T.
CORPORATE SOURCE: Dep. Chem., Univ. New Mexico, Albuquerque, NM, 87131, USA
SOURCE: Adv. Met. ULSI Appl. 1992, Proc. Conf. (**1993**), Meeting Date 1992, 83-9. Editor(s): Cale, Timothy S.; Pintchovski, Fabio S. Mater. Res. Soc.: Pittsburgh, Pa. CODEN: 59LFAS
DOCUMENT TYPE: Conference
LANGUAGE: English

AB The selective **chemical vapor deposition** of the compds., (hfac)CuL, where hfac = 1,1,15,5,5-hexafluoroacetylacetonate and L = trimethylphosphine (PMe3); 1,5-cyclooctadiene (1,5-COD); vinyltrimethylsilane (VTMS) and 2-butyne onto W in the presence of SiO2 has been studied as a function of surface pre treatment. Cleaning the substrates with hot aqueous H2O2, followed by washing and drying resulted in blanket copper deposition (except for L = PMe3). In contrast, the nucleation of copper onto SiO2 can be controlled by reacting the SiO2 surface with chlorotrimethylsilane regardless of the nature of L. Selectivity was lost after deposition times of approx. one minute. However, the length of time over which selectivity could be prolonged was increased by in situ treatment with Me2SiCl2 during the deposition experiment Under these conditions, selectivity could be retained and copper films 5000 Å thick were deposited selectively on W in the presence of SiO2.

IT **138312-65-9**
RL: USES (Uses)
(**CVD** of copper from, on tungsten in presence of silica)
RN 138312-65-9 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')bis(trimethylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)
Section cross-reference(s): 75
ST **CVD** copper tungsten copper diketonate; integrated circuit **CVD** copper diketonate; vapor deposition copper diketonate tungsten
IT Electric circuits
(integrated, **CVD** of copper from β-diketonates on silica on tungstate substrates in relation to interconnects for)
IT 7440-33-7, Tungsten, miscellaneous
RL: MSC (Miscellaneous)
(**CVD** of copper from β-diketonates on silica on substrate of)
IT 7631-86-9, Silica, miscellaneous
RL: MSC (Miscellaneous)
(**CVD** of copper from β-diketonates on, on tungstate substrate)
IT 7440-50-8D, Copper, β-diketonates
RL: TEM (Technical or engineered material use); USES (Uses)
(**CVD** of copper from, on silica on tungstate substrates, in relation to interconnects for integrated circuits)
IT 86233-74-1 137007-13-7 **138312-65-9** 139566-53-3
RL: USES (Uses)
(**CVD** of copper from, on tungsten in presence of silica)
IT 7440-50-8P, Copper, preparation
RL: PREP (Preparation)
(by **CVD** from copper β-diketonates, selective deposition on silica on tungsten by)
IT 75-77-4, Chlorotrimethylsilane, uses 75-78-5, Dichlorodimethylsilane
RL: USES (Uses)
(silica surface treatment with, for selective **CVD** of copper on silica on tungsten substrates)

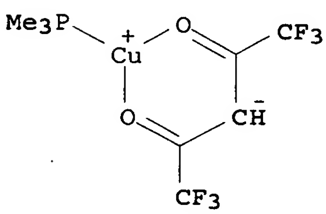
L37 ANSWER 14 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1994:20477 HCAPLUS
DOCUMENT NUMBER: 120:20477
TITLE: **CVD** and characterization of aluminum-copper metalization thin films
AUTHOR(S): Houlding, V. H.; Maxwell, H., Jr.; Crochiere, S. M.; Farrington, D. L.; Rai, R. S.; Tartaglia, J. M.
CORPORATE SOURCE: Bandgap Technol. Corp., Broomfield, CO, 80021, USA
SOURCE: Materials Research Society Symposium Proceedings (**1992**), 260(Advanced Metallization and Processing for Semiconductor Devices and Circuits-II), 119-24
CODEN: MRSPDH; ISSN: 0272-9172
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The **CVD** of Al-Cu thin films on Si, SiO2, and TiN substrates was examined in a vertical low pressure cold wall reactor using Me3NAlH3 at 20° as the Al source. The Cu sources CuL2 (HL = hexafluoroacetylacetone), CpCuPEt3, and LCuPMe3 were compared. The Cu content of the films was controlled .ltorsim.5% by simply varying the temperature of the Cu source. Codeposited Al-Cu films with excellent conductivity, purity, and adhesion properties were obtained with all Cu sources. Optimal film smoothness was achieved at .apprx.350°. The compds. differed in the ease of control over the %Cu in the films. CuL2 exhibited a massive parasitic

reaction which made control difficult. The Cu(I) complexes showed minor parasitic reactions. Anal. of films with high Cu content by SEM-EDS showed clear segregation of Cu and Al, consistent with the low solubility of Cu in Al. Films with >2% Cu appeared homogeneous on a μm scale by both SEM-EDS and SIMS depth profiling. TEM of film cross sections revealed a polycryst. Al film with small (20-100 Å) Cu-rich particles dispersed throughout the Al grains. These particles exhibited bright field-dark field contrast characteristic of crystalline material.

IT **135707-05-0**, (Hexafluoroacetylacetonato)(trimethylphosphine) copper
RL: USES (Uses)
(**CVD** and characterization of aluminum-copper metalization thin films using)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 76-2 (Electric Phenomena)

ST aluminum copper metalization **CVD**

IT 7440-21-3, Silicon, uses 7631-86-9, Silica, uses 25583-20-4, Titanium nitride (TiN)
RL: USES (Uses)
(**CVD** and characterization of aluminum-copper metalization thin films on)

IT 12261-30-2, (Cyclopentadienyl)(triethylphosphine)copper 14781-45-4, Bis(hexafluoroacetylacetonato)copper 16842-00-5, Trimethylamine-alane **135707-05-0**, (Hexafluoroacetylacetonato)(trimethylphosphine)copper
RL: USES (Uses)
(**CVD** and characterization of aluminum-copper metalization thin films using)

IT 11100-88-2 11122-18-2 11146-04-6 79080-49-2 87986-89-8 122487-02-9, Aluminum 97.9, copper 2.1
RL: USES (Uses)
(**CVD** and characterization of metalization thin films of)

L37 ANSWER 15 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

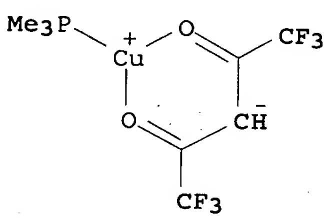
ACCESSION NUMBER: 1993:638205 HCAPLUS
DOCUMENT NUMBER: 119:238205
TITLE: Role of solvents in **chemical vapor deposition**: implications for copper thin-film growth
AUTHOR(S): Chiang, Chao Ming; Miller, Timothy M.; Dubois, Lawrence H.
CORPORATE SOURCE: AT and T Bell Lab., Murray Hill, NJ, 07974, USA
SOURCE: Journal of Physical Chemistry (**1993**), 97(45), 11781-6

CODEN: JPCHAX; ISSN: 0022-3654
DOCUMENT TYPE: Journal
LANGUAGE: English

AB . Recent studies showed that the rate of Cu film growth from the **CVD** of solid Cu(II) β-diketonates is enhanced in the presence of selected solvents. To shed light on the role of solvents in **CVD** processes, the vapor-phase, solution, and surface chemistries of bis(hexafluoracetylacetonato)copper(II) (Cu(hfac)2) and (hexafluoroacetylacetonato)(trimethylphosphine)copper(I) (Cu(hfac)(PMe3)) dissolved in alc. (MeOH, EtOH, iso-Pr alc.), acetone, THF, toluene, and H2O were studied by mol. beam/mass spectrometry, NMR, and reflection-absorption IR spectroscopies. Alcs. and H2O reversibly coordinate to Cu(hfac)2 to form alcoholates and hydrates, resp. The ethanolates and hydrates are substantially more volatile than the pure precursor, thus increasing the delivery rate of these solvent-coordinated complexes to the substrate. While alcs. do not react with either Cu(hfac)2 or Cu(hfac)(PMe3) at room temperature, H2O reacts directly with these compds. leading to the partial reduction of Cu(II) and the partial oxidation of Cu(I) species. The implications of these results for the growth of Cu thin films by **CVD** are discussed.

IT **135707-05-0**
RL: PROC (Process)
(surface chemical of, in **CVD** of copper films, solvent effects on)

RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56, 68
IT Solvent effect
(on **CVD** of copper from diketonates)
IT 14781-45-4 **135707-05-0**
RL: PROC (Process)
(surface chemical of, in **CVD** of copper films, solvent effects on)

L37 ANSWER 16 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1993:570641 HCAPLUS
DOCUMENT NUMBER: 119:170641
TITLE: **CVD** of copper from (β-diketonate)CuLn copper(I) precursors
AUTHOR(S): Chi, Kai Ming; Jain, A.; Hampden-Smith, M. J.; Kodas, T. T.
CORPORATE SOURCE: Dep. Chem., Univ. New Mexico, Albuquerque, NM, 87131, USA
SOURCE: Materials Research Society Symposium Proceedings (**1992**), 260(Advanced Metallization and

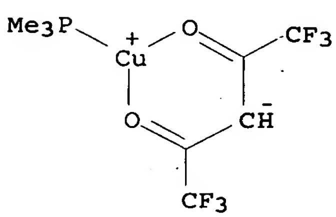
Processing for Semiconductor Devices and Circuits-II), 629-4
CODEN: MRSPDH; ISSN: 0272-9172

DOCUMENT TYPE: Journal
LANGUAGE: English

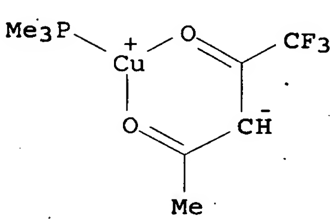
AB Selective **CVD** of Cu is the focus of recent research interest as a result of possible applications as vertical interconnect material in multilevel metalization. A variety of Cu(I) and Cu(II) compds. have been used to deposit Cu. In some cases, the compds. selectively deposit Cu on various different surfaces. However, the origin of this selectivity is not unambiguously established at this stage. To derive a better understanding of the **CVD** processes, Cu(I) compds. (β-diketonate)CuLn were synthesized and used as **CVD** precursors. The new species (fod)CuL, where fod = 2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedionate and L = PMe3, 1,5-cyclooctadiene, 2-butyne, bis(trimethylsilyl)acetylene and vinyltrimethylsilane are described. The **CVD** of Cu and factors affecting selective Cu deposition are discussed here.

IT **135707-05-0 135707-06-1 135707-07-2**
149610-37-7
RL: RCT (Reactant); RACT (Reactant or reagent)
(thermal decomposition of, in **CVD** of copper films)

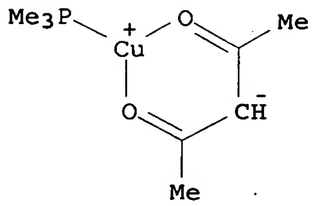
RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



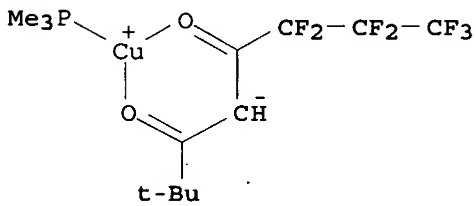
RN 135707-06-1 HCAPLUS
CN Copper, (1,1,1-trifluoro-2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 135707-07-2 HCAPLUS
CN Copper, (2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 149610-37-7 HCAPLUS
CN Copper, (6,6,7,7,8,8,8-heptafluoro-2,2-dimethyl-3,5-octanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 29
ST deposition copper diketonate precursor chem vapor; **CVD** copper diketonate precursor decompn
IT 86233-74-1 95345-03-2 **135707-05-0** **135707-06-1** **135707-07-2** 137007-13-7 137039-38-4 139566-53-3 149134-18-9 **149610-37-7** 149610-38-8 149610-39-9 149610-40-2 149634-54-8 150238-30-5
RL: RCT (Reactant); RACT (Reactant or reagent)
(thermal decomposition of, in **CVD** of copper films)

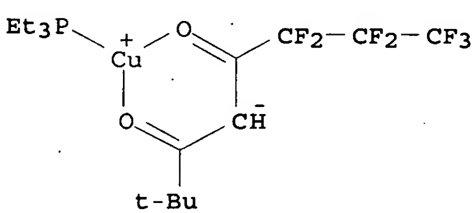
L37 ANSWER 17 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1993:539396 HCAPLUS
DOCUMENT NUMBER: 119:139396
TITLE: Chemistry of copper(I) β-diketonate complexes. VI. Synthesis, characterization and **chemical vapor deposition** of 2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedione (fod) copper(I) (fod)CuL complexes and the solid state structure of (fod)Cu(PMe3)
AUTHOR(S): Chi, K. M.; Corbitt, T. S.; Hampden-Smith, M. J.; Kodas, T. T.; Duesler, E. N.
CORPORATE SOURCE: Department of Chemistry and, Albuquerque, NM, 87131, USA
SOURCE: Journal of Organometallic Chemistry (**1993**), 449(1-2), 181-9
CODEN: JORCAI; ISSN: 0022-328X
DOCUMENT TYPE: Journal
LANGUAGE: English
AB A series of copper(I) compds. of the general formula (fod)CuL, where fod = 2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedione, and L = PMe3, PEt3, 1,5-cyclooctadiene (1,5-COD), vinyltrimethylsilane (VTMS), 2-butyne, bis(trimethylsilyl)acetylene (BTMSA), have been

prepared by the reaction of Na[fod] with CuCl in the presence of the appropriate amount of the Lewis base, L. All the compds. were characterized by elemental anal., 1H, 13C, 19F, 31P and IR spectroscopies. The spectroscopic data are consistent with the chelation of the β-diketonate ligand through its oxygen atoms to the copper(I) center. The anal. data are consistent with the empirical formula (fod)CuL. One compound, (fod)CuPMe3, was characterized in the solid-state by single-crystal x-ray diffraction which confirmed the empirical formula and revealed the monomeric nature of this species in the solid state. The distorted trigonal planar coordination environment observed for this species is common to these species. The Cu-O distances are significantly different within the limits of error on the data possibly as a result of inductive effects of the different β-diketonate substituents. Hot- and cold-wall **chemical vapor deposition** expts. revealed that these species are generally not suitable as precursors for the deposition of copper due to their low thermal stability. While pure copper films could be deposited, as determined by Auger electron spectroscopy, from the compds. (fod)CuL, where L = PMe3, 2-butyne and BTMSA, heating the precursors to increase their vapor pressures resulted in significant thermal decomposition in the source reservoir. As a result, deposition rates of only 100 Å/min were achieved. No selectivity was observed on W vs. SiO2 substrates under the conditions employed. The other compds., (fod)CuL, where L = 1,5-COD, VTMS, were too thermally unstable for **CVD** expts.

IT **149634-53-7P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

RN 149634-53-7 HCAPLUS

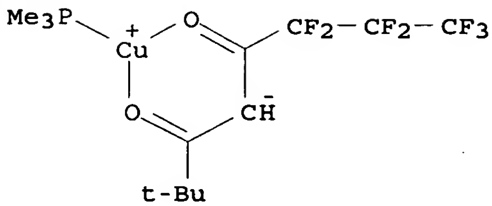
CN Copper, (6,6,7,7,8,8,8-heptafluoro-2,2-dimethyl-3,5-octanedionato-O,O')(triethylphosphine)- (9CI) (CA INDEX NAME)



IT **149610-37-7P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation, crystal and mol. structure, and **CVD** of copper from)

RN 149610-37-7 HCAPLUS

CN Copper, (6,6,7,7,8,8,8-heptafluoro-2,2-dimethyl-3,5-octanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 29-9 (Organometallic and Organometalloidal Compounds)
Section cross-reference(s): 75, 78

ST copper **CVD**; octanedione dimethylheptafluoro copper Lewis base complex; Lewis base dimethylheptafluorooctanedione copper complex; crystallog Lewis base dimethylheptafluorooctanedione copper complex

IT 149610-39-9P 149610-40-2P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and **CVD** of copper from)

IT 149610-38-8P **149634-53-7P** 149634-54-8P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

IT **149610-37-7P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation, crystal and mol. structure, and **CVD** of copper from)

L37 ANSWER 18 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

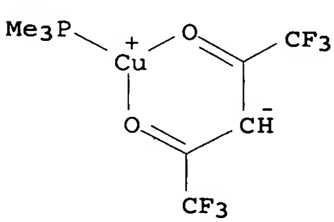
ACCESSION NUMBER: 1992:662463 HCAPLUS
DOCUMENT NUMBER: 117:262463
TITLE: Depositing copper patterns on Teflon
AUTHOR(S): Rye, R. R.; Hampden-Smith, M. J.; Kodas, T. T.
CORPORATE SOURCE: Sandia Natl. Lab., USA
SOURCE: JOM (**1992**), 44(7), 56-7
CODEN: JOMMER; ISSN: 1047-4838
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Hexafluoroacetylacetonatotrifluorophosphinecopper(I) is used for **CVD** of copper patterns on Teflon.

IT **135707-05-0**
RL: PRP (Properties)
(in copper pattern deposition, on Teflon, by **CVD**)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)

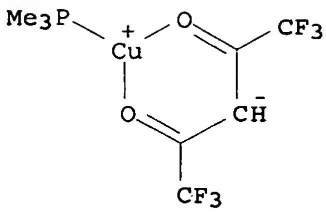


CC 76-4 (Electric Phenomena)

ST copper **CVD** pattern Teflon; hexafluoroacetylacetonatocopper

complex **CVD** copper Teflon
IT **Vapor deposition** processes
(**chemical**, in copper pattern deposition, on Teflon)
IT Electric circuits
(printed, boards, copper pattern deposition on Teflon, by metalorg. **CVD**)
IT 9002-84-0, Teflon
RL: PRP (Properties)
(copper pattern deposition on, by metalorg. **CVD**)
IT **135707-05-0**
RL: PRP (Properties)
(in copper pattern deposition, on Teflon, by **CVD**)
IT 7440-50-8, Copper, properties
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(pattern deposition of, on Teflon, by metalorg. **CVD**)

L37 ANSWER 19 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1992:460444 HCAPLUS
DOCUMENT NUMBER: 117:60444
TITLE: Patterned deposition of copper on poly(tetrafluoroethylene)
AUTHOR(S): Rye, R. R.; Chi, K. M.; Hampden-Smith, M.; Kodas, T. T.
CORPORATE SOURCE: Sandia Natl. Lab., Albuquerque, NM, 87185, USA
SOURCE: Journal of the Electrochemical Society (**1992**), 139(6), L60-L61
CODEN: JESOAN; ISSN: 0013-4651
DOCUMENT TYPE: Journal
LANGUAGE: English
AB A 3-step process was developed for patterned deposition of Cu onto poly(tetrafluoroethylene) (PTFE). The 1st step involves patterned irradiation with low doses of x-rays or electrons which cross-link the PTFE surface; step 2 involves chemical etching with the result that only the nonirradiated, noncross-linked areas are etched; and step 3 involves selective **chemical vapor deposition** (**CVD**) of Cu onto the etched surface at 200° using (hexafluoroacetylacetonato)Cu(I)trimethylphosphine ((hfac)Cu(PMe3)). The nonirradiated surface is activated for selective Cu **CVD** by the chemical etching step, while the irradiated portions remain unactivated due to crosslinking. Continuous Cu films with resistivities of 4 μohm-cm are formed on the nonirradiated areas. X-ray photoelectron spectra show the nonirradiated areas of the surface to be covered by pure Cu with only surface impurities resulting from air transfer of the samples, while the irradiated areas show the presence of only C and F, characteristic of PTFE.
IT **135707-05-0**
RL: USES (Uses)
(vapor deposition of copper from, on poly(tetrafluoroethylene))
RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 76-11 (Electric Phenomena)
Section cross-reference(s): 38, 66, 75
IT **135707-05-0**
RL: USES (Uses)
(vapor deposition of copper from, on poly(tetrafluoroethylene))

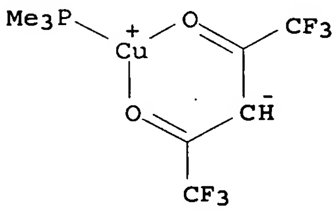
L37 ANSWER 20 OF 24 HCAPLUS

ACCESSION NUMBER: 1992:453653 HCAPLUS
DOCUMENT NUMBER: 117:53653
TITLE: Hot-wall **chemical vapor deposition** of copper from copper(I) compounds. 2. Selective, low-temperature deposition of copper from copper(I) β-diketonate compounds, (β-diketonate)CuLn, via thermally induced disproportionation reactions
AUTHOR(S): Shin, H. K.; Chi, K. M.; Hampden-Smith, M. J.; Kodas, T. T.; Farr, J. D.; Paffett, M.
CORPORATE SOURCE: Cent. Micro-Eng. Ceram., Univ. New Mexico, Albuquerque, NM, 87131, USA
SOURCE: Chemistry of Materials (**1992**), 4(4), 788-95
CODEN: CMATEX; ISSN: 0897-4756
DOCUMENT TYPE: Journal
LANGUAGE: English
AB **CVD** of Cu using (β-diketonate)Cu(PR3)n (n = 1 and 2), (β-diketonate)Cu(1,5-cyclooctadiene), and (β-diketonate)Cu(alkyne) (where β-diketonate = hexafluoroacetylacetonate (hfac), trifluoroacetylacetonate, and acetylacetonate; R = Me and Et; alkyne = bis(trimethylsilyl)acetylene, trimethylsilylpropyne, and 2-butyne) was studied on Pt, W, Cu, and SiO_2 substrates at 100-400°. Large variations in the selectivity were observed as a function of the nature of the Cu ligands, substrate temperature, and nature of the substrate. In the series of compds. (hfac)Cu(PMe3), (hfac)Cu(PMe3)2, (hfac)Cu(PEt3), (hfac)Cu(PEt3)2 (hfac)Cu(1,5-cyclooctadiene), and (hfac)Cu(2-butyne), where the number and nature of the neutral Lewis base ligand was varied, only (hfac)Cu(PMe3) and (hfac)Cu(PEt3) exhibited selective deposition. The lowest temperature at which deposition occurred changed dramatically as a function of the number and nature of Lewis base ligands. Deposition rates as high as 1200 Å/min were observed under unoptimized conditions. The Cu films were characterized by AES which showed high-purity Cu within the detection limits. Resistivities varied from 1.7 to 8 μΩ cm, depending on the deposition conditions. All of the compds. investigated deposited Cu via the thermally induced disproportionation reaction
2(β-diketonate)CuLn → Cu + Cu(β-diketonate)2 + 2nL.
This reaction stoichiometry was quantified for (hfac)Cu(1,5-

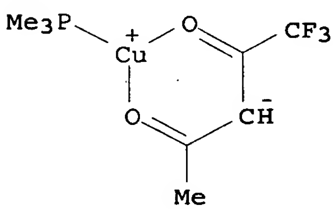
cyclooctadiene) and (hfac)Cu(2-butyne), and explains the high purity of the films which results from the absence of thermally induced ligand decomposition

IT **135707-05-0 135707-06-1 135707-07-2**
RL: RCT (Reactant); RACT (Reactant or reagent)
(copper selective **CVD** by disproportionation of)

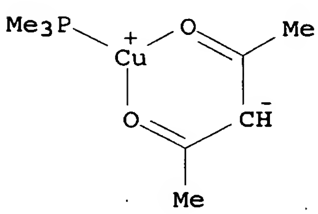
RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 135707-06-1 HCAPLUS
CN Copper, (1,1,1-trifluoro-2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 135707-07-2 HCAPLUS
CN Copper, (2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 56-6 (Nonferrous Metals and Alloys)
IT **Vapor deposition** processes
(**chemical**, selective, of copper by thermal disproportionation of β-diketonate compds.)
IT 7440-50-8, Copper, miscellaneous
RL: MSC (Miscellaneous)
(**CVD** of, selective, by thermal disproportionation of β-diketonate compds.)
IT **135707-05-0 135707-06-1 135707-07-2**

RL: RCT (Reactant); RACT (Reactant or reagent)
(copper selective **CVD** by disproportionation of)

IT 7440-06-4, Platinum, uses 7440-33-7, Tungsten, uses 7631-86-9, Silicon dioxide, uses
RL: USES (Uses)
(copper selective **CVD** on, by thermal disproportionation of β-diketonate compds.)

L37 ANSWER 21 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1992:437454 HCAPLUS
DOCUMENT NUMBER: 117:37454
TITLE: **Chemical vapor deposition** of a metal from a ligand-stabilized (+1) metal beta-diketonate coordination complex
INVENTOR(S): Baum, Thomas H.; Larson, Carl E.; Reynolds, Scott K.
PATENT ASSIGNEE(S): International Business Machines Corp., USA
SOURCE: U.S., 5 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5096737	A	19920317	US 1990-602970	19901024 <--
CA 2090038	AA	19920425	CA 1991-2090038	19910123 <--
WO 9207971	A1	19920514	WO 1991-US487	19910123 <--
W: CA, JP				
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, NL, SE				
EP 554246	A1	19930811	EP 1991-904873	19910123 <--
EP 554246	B1	19970604		
R: DE, FR, GB, IT				
JP 06501287	T2	19940210	JP 1991-504669	19910123 <--
JP 2612986	B2	19970521		
US 5220044	A	19930615	US 1992-852285	19920316 <--

PRIORITY APPLN. INFO.: US 1990-602970 A 19901024

<--
WO 1991-US487 W 199101 23
<--

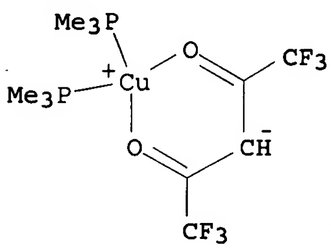
OTHER SOURCE(S): MARPAT 117:37454

AB Cu, Ag, Rh, or Ir is deposited by decomposition of a β-diketonate complex of the metal, induced by heat, laser radiation, or a plasma.

IT **138312-65-9 142277-07-4**
RL: RCT (Reactant); RACT (Reactant or reagent)
(decomposition of, in **CVD** of copper)

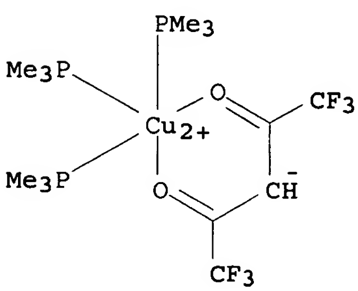
RN 138312-65-9 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')bis(trimethylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



RN 142277-07-4 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-O,O')tris(trimethylphosphine)- (9CI) (CA INDEX NAME)



IC ICM B05D003-06
ICS B05D005-12; C23C016-06

INCL 427038000

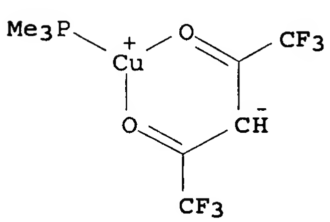
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 78

ST **CVD** metal diketonate complex; ketonate complex metal **CVD**; copper **chem vapor deposition**; silver **chem vapor deposition**; rhodium **chem vapor deposition**; iridium **chem vapor deposition**

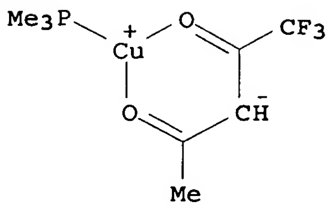
IT 7439-88-5, Iridium, reactions 7440-16-6, Rhodium, reactions 7440-22-4, Silver, reactions 7440-50-8, Copper, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**CVD** of, by decomposition of ligand-stabilized β-diketonate coordination compds.)

IT 86233-74-1 **138312-65-9** **142277-07-4** 142277-08-5
142299-45-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(decomposition of, in **CVD** of copper)
IT 32610-47-2
RL: RCT (Reactant); RACT (Reactant or reagent)
(decomposition of, in **CVD** of rhodium)
IT 38892-25-0
RL: RCT (Reactant); RACT (Reactant or reagent)
(decomposition of, in **CVD** of silver)

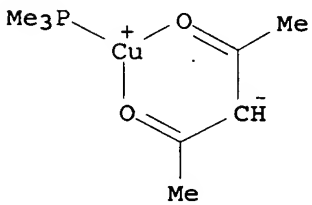
L37 ANSWER 22 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1992:111195 HCAPLUS
DOCUMENT NUMBER: 116:111195
TITLE: Synthesis of new copper(I) β-diketonate compounds for **CVD** of copper
AUTHOR(S): Shin, H. K.; Chi, K. M.; Hampden-Smith, M. J.; Kodas, T. T.; Farr, J. D.; Paffett, M. F.
CORPORATE SOURCE: Dep. Chem., Univ. New Mexico, Albuquerque, NM, 87131, USA
SOURCE: Materials Research Society Symposium Proceedings (**1991**), 204(Chem. Perspect. Microelectron. Mater. 2), 421-6
CODEN: MRSPDH; ISSN: 0272-9172
DOCUMENT TYPE: Journal
LANGUAGE: English
AB (β-Diketonate)Cu(I) tri-Me-phosphine compds. were prepared These species exist as liqs. or low-melting solids at room temperature The utility of these compds. as precursors for Cu was examined High purity films with low resistivities were deposited under a variety of conditions. Selective Cu deposition was observed as a function of the substrate, precursor, and substrate temperature Evidence consistent with thermally-induced disproportionation of the title compds. to form Cu metal and Cu(II)(β-diketonate)2 during deposition.
IT **135707-05-0** **135707-06-1** **135707-07-2**
RL: USES (Uses)
(**CVD** from precursor of)
RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 135707-06-1 HCAPLUS
CN Copper, (1,1,1-trifluoro-2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



RN 135707-07-2 HCAPLUS
CN Copper, (2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



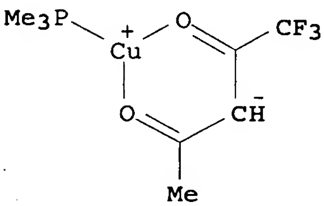
CC 56-4 (Nonferrous Metals and Alloys)
IT Vapor deposition processes
(**CVD**, of copper, β-diketonate-copper-triMephosphine precursors for)
IT **135707-05-0 135707-06-1 135707-07-2**
RL: USES (Uses)
(**CVD** from precursor of)
IT 7440-50-8, Copper, uses
RL: USES (Uses)
(**CVD** of, β-diketonate-copper-tri-Me-phosphine precursors for)

L37 ANSWER 23 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1991:646732 HCAPLUS
DOCUMENT NUMBER: 115:246732
TITLE: **Chemical vapor deposition** of copper from metal-organic copper(I) phosphine complexes
AUTHOR(S): Shin, H. K.; Hampden-Smith, M. J.; Kodas, T. T.; Duesler, E. N.; Farr, J. D.; Paffett, M.
CORPORATE SOURCE: Cent. Micro-Eng. Ceram., Univ. New Mexico, Albuquerque, NM, 87131, USA
SOURCE: Materials Research Society Symposium Proceedings (**1990**), 187(Thin Film Struct. Phase Stab.), 193-7
CODEN: MRSPDH; ISSN: 0272-9172
DOCUMENT TYPE: Journal
LANGUAGE: English
AB LCu(PMe3) (HL = acetylacetone and trifluoro- and hexafluoroacetylacetone) prepared which were specifically designed as precursors for the (**CVD**) of Cu. These species were designed such that the effects of systematic ligand variations on the **CVD** process was examined A solid state x-ray diffraction study of LCu(PMe3) (HL = hexafluoroacetylacetone)

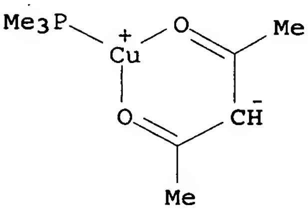
revealed that it is monomeric. Cryoscopic mol. weight determination and gas phase FTIR spectroscopy are consistent with a monomeric structure in liquid and gas phases. Hot-wall **CVD** of Cu from these precursors was examined under various conditions. Auger electron spectroscopy indicated that the films all exhibit some degree of C contaminatin, but little contamination by O, F, or P.

IT **135707-06-1P 135707-07-2P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and **chemical vapor deposition** of copper from)

RN 135707-06-1 HCAPLUS
CN Copper, (1,1,1-trifluoro-2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)

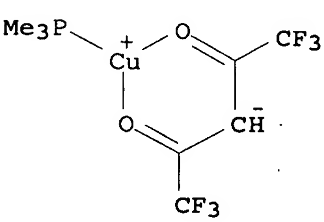


RN 135707-07-2 HCAPLUS
CN Copper, (2,4-pentanedionato-O,O')(trimethylphosphine)- (9CI) (CA INDEX NAME)



IT **135707-05-0P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and mol. structure and **chemical vapor deposition** of copper from)

RN 135707-05-0 HCAPLUS
CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)

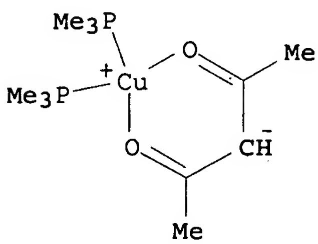


IT **135707-08-3P**

RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

RN 135707-08-3 HCAPLUS

CN Copper, (2,4-pentanedionato-O,O')bis(trimethylphosphine)-, (T-4)- (9CI) (CA INDEX NAME)



CC 78-9 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 29, 75

IT 7440-50-8P, Copper, preparation
RL: PREP (Preparation)
(**chemical vapor deposition** of, for diketonato phosphine complexes)

IT **135707-06-1P 135707-07-2P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and **chemical vapor deposition** of copper from)

IT **135707-05-0P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and mol. structure and **chemical vapor deposition** of copper from)

IT **135707-08-3P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of)

IT 89989-39-9
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction with diketonates and **chemical vapor deposition** of copper from)

L37 ANSWER 24 OF 24 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1991:518542 HCAPLUS

DOCUMENT NUMBER: 115:118542

TITLE: Selective low-temperature **chemical vapor deposition** of copper from (hexafluoroacetylacetonato)copper(I)trimethylphosphine, (hfa)CuP(Me)3

AUTHOR(S): Shin, H. K.; Chi, K. M.; Hampden-Smith, Mark J.; Kodas, Toivo T.; Farr, John D.; Paffett, Mark

CORPORATE SOURCE: Dep. Chem. Eng., Univ. New Mexico, Albuquerque, NM, 87131, USA

SOURCE: Advanced Materials (Weinheim, Germany) (**1991**), 3(5), 246-8
CODEN: ADVMEW; ISSN: 0935-9648

DOCUMENT TYPE: Journal

LANGUAGE: English

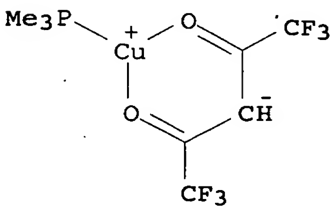
AB **Chemical vapor deposition** from (hexafluoroacetylacetonato)copper(I) trimethylphosphine (I), was used to prepare high-purity Cu films with low resistivities on Pt in the presence of SiO_2 at 150°. Deposition rates ≥1000 Å/min were attained. Smooth, dense, and fine-grained films

having good adhesion were obtained. Thermal decomposition of (I) was examined

IT **135707-05-0**
RL: USES (Uses)
(**chemical vapor deposition** of copper from, at low temps.)

RN 135707-05-0 HCAPLUS

CN Copper, (1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-κO,κO')(trimethylphosphine)- (9CI) (CA INDEX NAME)



CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 76

ST copper **chem vapor deposition** platinum; elec resistivity copper film

IT Electric resistance
(of copper films, on platinum, **chemical vapor deposition** in relation to)

IT 7440-06-4, Platinum, uses and miscellaneous
RL: USES (Uses)
(**chemical vapor deposition** of copper films on, at low temps.)

IT **135707-05-0**
RL: USES (Uses)
(**chemical vapor deposition** of copper from, at low temps.)

IT 7440-50-8, Copper, uses and miscellaneous
RL: USES (Uses)
(**chemical vapor deposition** of, on platinum, at low temps.)

=>